The Engineering and Mining Journal

WITH WHICH IS CONSOLIDATED "MINING AND METALLURGY."

VOL. LXXVII. NEW YORK, THURSDAY, JANUARY 21, 1904. No. 3.

THE ENGINEERING AND MINING JOURNAL. ESTABLISHED 1866

PUBLISHED EVERY THURSDAY,

261 BROADWAY, NEW YORK

TELEPHONE 6865 CORTLANDT. P. O. BOX 1833.
CABLE ADDRESS "ENGMINJOUR" NEW YORK.

T. A. RICKARD . . . . . EDITOR
FREDERICK HOBART, SAMUEL SANFORD . . . ASSOCIATE EDITORS

SPECIAL CONTRIBUTORS.

NEW YORK . . . . . R. W. RAYMOND, J. PARKE CHANNING, JOHN A. CHURCH, ROBERT T. HILL, JOSEPH STRUTHERS
BOSTON . . . . . W. R. INGALLS
PHILADELPHIA . . . . F. LYNWOOD GARRISON, R. A. F. PENROSE, JR.
SCRANTON, PA. . . . . WM. GRIFFITH
ANSTED, W. VA. . . . . W. N. PAGE
SPRINGFIELD, ILL. . . . . EDWARD H. COXE
WASHINGTON . . . . . S. F. EMMONS, EDWARD W. PARKER, J. E. SPURR, W. H. WEED
DENVER . . . . . PHILIP ARGALL, CHESTER W. PURINGTON
SAN FRANCISCO . . . . LOUIS JANIN, JR., CHARLES G. YALE
LONDON . . . . . A. G. CHARLETON, HENRY F. COLLINS, J. H. CURLE, T. KIRKE ROSE
SOUTH AFRICA . . . . . T. LANE CARTER, G. A. DENNY
AUSTRALIA . . . . . DONALD CLARK, F. DANVERS POWER

SUBSCRIPTION, payable in advance, $5.00 a Year of 52 numbers, INCLUDING POSTAGE in the UNITED STATES, CANADA, MEXICO, CUBA, PORTO RICO, HAWAII or the PHILIPPINES.

TO FOREIGN COUNTRIES, INCLUDING POSTAGE, $8.00 or its equivalent: 33 Shillings; 32 Marks; or 40 Francs.

NOTICE TO DISCONTINUE
Should be WRITTEN to the New York Office in every instance.

Copies are on sale at the news-stands of the following hotels:—Waldorf-Astoria, New York; Brown Palace, Denver; Palace Hotel, San Francisco; and the leading hotels in the principal cities.

HORACE M. SWETLAND.....PRESIDENT
J. T. MORRIS, Manager. F. J. PRATT, Treasurer

BRANCH OFFICES:

CHICAGO, Tel: Harrison 3326 . . 520 Monadnock Block
PITTSBURG, Tel. 504 Court . . . 701 Keystone Building
DENVER . . . . . 206 Boston Building
SALT LAKE CITY . . . . 76 East Fifth South St.
BUTTE, MONTANA . . . . 19 & 20 Owsley Block
SAN FRANCISCO, Tel. Bush 240 . . . 320 Sansome St.
LONDON, ENGLAND . . . 20 Bucklersbury, E. C.
DORTMUND, GERMANY . . . Arndt Strasse, 56

ADVERTISING COPY.
Should reach NEW YORK office by MONDAY morning of issue week; CHANGES OF COPY by the PRECEDING THURSDAY.

Copyright, 1904, by
THE ENGINEERING AND MINING JOURNAL.
Entered at New York Post Office as 2nd Class matter.

CONTENTS.

Editorials:
Notes 107
Gold Production in Russia..... 108
Kalgoorlie 108
Words and Their Ways..... 109
The Debris Question in California..... 109
Tin Supplies..... 109
Market Conditions..... 110
Metallics 110
Discussion:
Treatment of Sulpho-Telluride Ores *H. C. Hoover* 111
The Joplin District.....*Zinc Miner* 111
Sulphide Smelting.....*Herbert Lang* 111
A Bureau of Mining *Benjamin B. Lawrence and H. W. Turner* 113
The Canadian Mining Institute..... 114
The New Patent Law in Australia..... 114
*The Outlook for Mining in the New Territory Opened Up by the San Pedro, Los Angeles & Salt Lake Railroad.....*M. S. Duffield* 115
Losses in Vanning Tin Ores....*Richard Pearce* 116
Theories of Ore Deposition Historically Considered .....*S. F. Emmons* 117
*The Indicator, Ballarat..... 119
Fatal Accidents in Metal Mining in the United States .....*F. L. Hoffman* 119
*The Somerville Mines of the Beech Creek Coal & Coke Company..... 120
The Delprat or Salt-Cake Process for Mixed Sulphides .....*Donald Clark* 122
*Copper Production in Wyoming..... 122
*Roll-Jaw Crushers..... 123
The Production of the Minor Minerals—Bauxite, Graphite and Pyrite.....*Joseph Struthers* 123
Abstracts of Official Reports:
*Tomboy Gold Mines Company..... 125
Books Received..... 126
Books Reviewed..... 126
Correspondence:
Gold on the Saskatchewan..*S. H. Brockunier* 127
Questions and Answers..... 127
Recent Decisions..... 128
Patents Relating to Mining and Metallurgy:
United States..... 128
Great Britain..... 130

*Illustrated.

DEPARTMENTS

Assessments 143
Chemicals and Minerals:
New York..... 141
Foreign 142
Prices-Current 146
Coal Markets:
United States..... 139
Foreign 140
Dividends 143
Financial Notes:
Gold and Silver Movement..... 142
Prices of Foreign Coins..... 142
Industrial Notes..... 131
Iron and Steel Markets:
United States..... 140
Foreign 141
Metal Markets:
Silver 142
Copper, Tin, Lead, Spelter and Minor Metals 143
Average Monthly Prices Tables..... 143
Mining News:
Summaries: Denver, San Francisco, Spokane.. 132
London; Perth, W. A.; Melbourne; San Luis Potosi, Mex.; Toronto, Victoria, B. C..... 133
United States 134
Foreign 138
Mining Stocks:
Market Reviews..... 138
Quotations 144, 145
Obituary 131
Personals 131
Schools, Technical..... 131
Societies 131
Trade Catalogues..... 132

EDITORIAL.

WE DESIRE TO state that Mr. W. J. Johnston has transferred his interest in the ENGINEERING AND MINING JOURNAL to Mr. Horace M. Swetland; the former will have no further connection with the management. It is a pleasure to add that Mr. Swetland's experience as a successful publisher will be employed in furthering the best interests of this JOURNAL.

THE WORK DONE this year with a gold-dredge on Stewart river, in the Yukon, was chiefly of a preparatory kind, prospecting and preparing for another season. Enough was done, however, to promise success, and the work is to be carried on next season with the dredge now there; while a larger machine has been ordered, to extend operations. A considerable area of pay gravel was found at a depth of nine or ten feet below the river-bed.

THE GERMAN COAL SYNDICATE has strengthened its position for the new year by securing the adhesion of several coal mining concerns which have heretofore been independent, the most notable being the Haniel Company, which has always refused to join the syndicate. The control of the German coal trade now seems to be pretty well assured, and it will be a difficult matter for the few outside operators left to fight it; or for the buyers either, for that matter.

THE DOMINION Steel Company is going through a difficult period at present. It can hardly be called reconstruction, but rather settling down to work—scaling down costs, adjusting working forces and pruning down the extravagances incident to a period of construction and expansion. It is not altogether a pleasant process, but a salutary one. With its excellent plant and other advantages the company ought to have a prosperous future before it, when the readjustments are completed.

THERE HAS BEEN a pitchblende excitement in north Cornwall, England, by reason of the alleged discovery of deposits containing a radio-active variety of this uranium oxide. All the available ground was quickly taken

up and there was quite a local boom. In this case, as in similar occurrences in the West, lately, it has been assumed that pitchblende was necessarily a commercial source of radium, and irresponsible chemists have reported the presence of the new element merely by inference. As a matter of fact, much pitchblende, undoubtedly radio-active, has turned out to be of no commercial value as a source of radium. The untechnical public will do well not to be misled by promoters who speak confidently on matters which are still among the new problems of science.

THE EFFORTS being made to introduce improvements into the system of technical education at the Royal School of Mines, in London, are progressing slowly. People in England are so conservative that it takes a geological period to get results; and there is such a bristling array of vested rights, interests and traditions, that the problem of amelioration is very much more complex than in a new country, like the United States, where a system can be outlined upon clean sheets, with all that has been done by the rest of the world as a source of inspiration and information.

ON ANOTHER PAGE we publish a valuable article by our distinguished friend, Mr. Richard Pearce. The experiments made by him to test the accuracy of tin-dressing in Cornwall will be found of practical value, and, we hope, will also prove suggestive to those responsible for the treatment of ores in the "old country." It is interesting to state that Mr. Pearce did all the vanning—that is, mechanical assaying of tin ores—at Dolcoath, when a young man of 20 years, so that his investigations into the methods still in vogue there, after he himself has added more than 40 years of metallurgical work to his youthful experience, represent results of peculiar interest to professional men.

In commenting recently upon the extreme usefulness of the vanning shovel as an implement for investigating ores, we drew attention to the fact that instruction in vanning is rarely included in the training afforded by schools of mines. We are informed that the manipulation of the vanning shovel is taught to students at the Institute of Technology, at Boston, and we would be glad to hear that such is, or will be, the case at other technical colleges of similar high standing.

STATISTICS OF accidents in mining, as heretofore collected and presented, have related to coal mining much more generally than to the various branches of metal mining. This doubtless results from the fact that coal mining has been carried on upon a larger scale, and has presented certain dangers of its own, which seem to require regulation by law. There are special risks from fire and gas explosions, which are not present in metal mines, and which are apt to attract much more public attention. Nevertheless, metal mining has risks of its own which deserve to be carefully considered. In the article which we publish, part in our last issue, and part on another page of the present number, such statistics as are available in relation to accidents in metal mines have been carefully presented and compared. The author of the article has made a special study of risks to life in various occupations, and the facts which he presents deserve attention. It is to be hoped, also, that more care may be taken hereafter in collecting statistics of this kind.

GOLD SHIPMENTS from Australia this year have been unusually large, amounting, for the 11 months ending with November, to £15,634,692, a gain of 36 per cent over the previous year. The increase is much greater than that in production, and this seems to show that Australia has been paying up some foreign debts. A remarkable fact in connection with these shipments is that over half the total amount—£8,078,638—went to India. The Indian treasury has evidently found it more economical to ship gold directly from Australia than from London, and this movement is increasing. Another Australian shipment, somewhat out of the usual run, is the dispatch of £1,600,000 in sovereigns to South Africa, doubtless on London account.

GOLD PRODUCTION IN RUSSIA.

In the JOURNAL for January 7 we estimated the gold production of Russia in 1903 at $24,000,000. It nows seems that, although this estimate was close to the actual figures, it was still a little below the mark. Our special correspondent informs us that the receipts of gold at the Imperial mints, up to December 31, 1903, amounted to a total of 34,170 kilograms of fine gold, which is equivalent to $22,709,382. By law all gold mined in Russian territory is supposed to be turned over to the mint, through its various local branches. It is customary, however, to make an allowance of 10 per cent for gold secreted in various ways and not returned to the authorities. Making this addition, we find a total of $24,980,320. With regard to this allowance, we have been assured by those who have had wide experience in mining, especially in Siberia, that it is a very conservative one. In some portions of that country there is little doubt that even a larger proportion than 10 per cent fails to reach the hands of the authorities; much depending, of course, on the situation of the mines and the possibilities of concealment and sale of the metal.

It should be noted also that, strictly speaking, there may be possibly a little variation between the actual production at the mines and the receipts at the mint within a given period. Necessarily, some time is occupied in transmitting the gold from the mines, and shipments made before the close of the year would not be reported until received, and would, therefore, appear in the production of the next year. This error would not be very large, however, and, taking a series of years together, it would practically correct itself. The mint receipts are the accessible figures, and those which have to be taken.

The receipts of silver by the mints during the year, 1903, reached a total of 8,111 kilograms, of which 4,846 kilograms were reported as refined or pure silver, and 3,265 kilograms as unrefined metal.

KALGOORLIE.

Among the features of the past year which mark the substantial progress of the mining industry is the technical advance made at Kalgoorlie, the great gold-field of Australia. After having survived the whooping-cough of a boom and the measles of a bear campaign, the mining companies of Kalgoorlie have faced the realities of legitimate mining, and are now winning a substantial reward. Not only has an era of sound business succeeded to a period of wanton stock gambling, with all its attendant evils of jobbery and chicane, but by a vigorous development of ore-reserves and a consistent policy of economy the big properties have reached the satisfactory position of being considered safe investments. This result has coincided with the gradual supremacy of the engineering side of mining and the retirement of the stock-jobbing aspect; the management of operations by engineers, instead of the dreary messes of inexperienced, if not irresponsible, promoters. The evolution of a quiet, successful industry out of all the pyrotechnics and powder-smoke of a former period is a result which, while helpful to the district itself, is vastly more important as an object lesson to the financial world of London. We congratulate our professional friends, many of them American engineers, who have been instrumental in proving that science is greater than spoof, and that legitimate mining is more remunerative, in the end, than the weird vagaries of that kind of finance which regards the mine no more than the plunger on the race-course considers the horse, which furnishes an excuse for his betting proclivities. In spite of natural difficulties of no mean kind and an ore presenting serious metallurgical obstacles, the managers at Kalgoorlie have brought down costs so that they challenge the records of mines far more favorably situated. They are fortunate, also, in having been able, during 1903, to prove the persistence of the ore-bodies, by bore-holes and actual mine-workings, to a depth of 1,750 ft. It is well enough to decrease costs, but it is equally necessary

to increase ore-reserves on which to apply such economic exploitation. We trust that 1904 will see a continuation of satisfactory development in both departments of engineering skill.

WORDS AND THEIR WAYS.

We referred the other day to the common blunder of employing the term 'chute' to designate a defined ore-body, instead of using 'shoot,' which is the word particularly set aside in technical literature for that purpose. There are other mistakes to which attention may properly be called. 'Upraise' is an unfortunate colloquialism which has crept into mining parlance. A raise must be *up;* it would be quite as proper to say a '*down*winze' as it is to say an *up*raise.'

The term 'country rock' amounts to tautology, as has been pointed out by Le Neve Foster. A drift was recently described in a Western report as being "in no formation," meaning thereby nothing that had any definite structure; but a mine working cannot well penetrate aught but rock unless it be a snowdrift, as happened once with the crafty contractors who closely timbered 50 ft. of adit which went from the outer air through a snowslide before it became a bore in a granite mountain. Why cannot we be content with saying "the country is granite," "the lode penetrates a schist country," "the vein exhibits limestone country on both walls," etc. Lodes and veins do not pass into thin air, except in the flamboyant pages of an illusive prospectus.

Finally, we dare to run a tilt against that unpretentious little word, 'very.' Now, 'very' presupposes a standard of comparison. A four-story brick building is a "very large" edifice in Salmon City, Idaho, but it is nothing of the sort in New York City; a mine with a 1,000-ft. shaft and 3,000 ft. of lateral development is a "very big" undertaking at Searchlight, in Nevada, but it is a small mine at Virginia City. When a man says the ore is "very rich" it depends upon where he starts with rich ore; in some regions 25 dwt. of gold per ton means "very rich" ore, in others it is too poor to be exploited profitably. For instance, suppose a man writes "The district is very prosperous, there being very many rich mines, very deep and very extensive, so that there is very good hope of very many years of very successful development." Not one of these emphatics has any meaning unless the reader knows the writer's standards of prosperity, richness, depth, extension, etc. There is an irritating air of exaggeration about statements burdened with a frequent use of this word 'very,' and, on the contrary, there is a restful suggestion of moderation and knowledge in the descriptions which convey ideas of relation without a repeated lashing of that wearisome word. If our readers will apply the test to the average writing of the day, he will find little is lost by omitting very and much, but not "very much" is gained by their use.

THE DEBRIS QUESTION IN CALIFORNIA.

The recent decision of the Supreme Court in California, with relation to ground-sluice mining, may possibly have far-reaching results. This decision says, in effect, that "ground-sluice mining, according to the evidence, produces the same effect in kind as the hydraulic process of mining, though to a less degree." At a recent meeting of the Executive Committee of the California State Miners' Association, careful consideration was given to this matter, and it was decided to print the decision in full, and to send a copy to every gravel and quartz mine in the State. The object of this is to warn operators of what may be expected if the Anti-Debris Association should take advantage of the decision to enjoin ground-sluice and other miners who dump tailings or debris into streams, branches or tributaries of the various rivers.

Although it was not directly stated at the meeting, the main object of this action is to call the attention of quartz miners to the danger now menacing their particular form of gold mining industry. Under this decision, it may well be held that the "same effect in kind, though to a less degree," results from this as well as from hydraulic mining. Some of the big stamp-mills now send from 500 to 1,000 tons of tailings daily down the cañons, after the ore has been milled, cyanided, or has received other treatment. This is a greater quantity of debris than results from ordinary ground-sluicing operations, and it will doubtless be only a question of time before the anti-debris men will be getting out injunctions against quartz miners, provided the United States Supreme Court does not reverse this decision. Some of the big quartz mining companies would certainly afford rich pickings to agents and informers as the big hydraulic companies have in the past.

This decision, should it stand, in effect leaves California miners in precisely the same position as they were after the North Bloomfield decision closed the hydraulic mines, and before the Caminetti law was passed. While there was then no specific law against any form of mining, hydraulic work was forbidden, practically, because any one could get out an injunction against any miner who allowed debris to pass into a stream, or to a point where it might possibly injure adjacent land, or land at any distance, to which a stream might carry the waste material. There were then no conditions under which a hydraulic miner could legally carry on his work. The Caminetti law prescribed a way in which hydraulic mining could be done in certain portions of the State, and work has been conducted since then under the direction of the board established by this law.

This new decision, however, is not confined, like the previous law, to the "drainage basins of the Sacramento and San Joaquin rivers," but applies in all counties of the State. While quartz mines are not directly mentioned, the principle enunciated by the decision applies to them, as well as to any other form of mining, provided water is used to carry off tailings or debris. It looks very much as if the quartz miners would have to get together with the ground-sluice miners, and make common cause. If they do not, they may be subjected to a great deal of annoyance, and to injunction suits. It is probable that they will see this, and will be ready to act through the California Miners' Association, which presents the most practical means for common action.

TIN SUPPLIES.

The question of tin supplies for the world is one which has been discussed for years, without any satisfactory answer. For some time past the consumption of tin has been close to the production; in fact, it is quite probable that for two or three years consumption has been slightly in excess. The accumulated stocks, in the East and elsewhere, which existed several years ago, have disappeared, and the market depends entirely upon current production. The use of tin—chiefly in the form of tin-plate, or iron and steel sheets coated with tin—has increased very largely, owing to the establishment and growth of the canning industries, and to the use of cases, or tin cans, in shipping oil. The business of canning—that is, of preserving vegetable and other food—has assumed great proportions; and no satisfactory substitute for tin-plate in this industry has been found, or seems likely to be found. Apart from this, the use of tin-plate for roofing, for household utensils and other similar purposes, has constantly extended, as well as the demand for metallic tin in making alloys.

Our main supply of the metal is drawn from the East, the quantities obtained from the old mines of Cornwall, in England, from Bolivia and from Australia being comparatively small. These supplies, also, are not increasing, and it is only from Bolivia that any gain can be expected; but we really know little of the actual resources of that country. In the East itself, the output from Banka and Billiton, in the Dutch East Indies, is falling off, while the Singkep mines, once considered promising, are now closed.

The main supply available for trade is Straits tin, as the metal from the Malay Peninsula is called. The tin deposits of that region are very extensive, and it is from them that any immediate increase of output must come. To obtain a much greater production than is made at present, however, will require

important changes in the system of mining, which cannot easily be brought about. The region is difficult to prospect, and much of it is an unhealthy, tropical country, where white labor on a large scale is impossible; while as long as mining work remains almost entirely in the hands of Chinese, as it is at present, the introduction of machinery presents formidable difficulties.

Under these circumstances, the reported discoveries of tin in Alaska are of great importance. Should further exploration show the existence of tin in large quantities, the benefit to trade, and especially to our own country, will be marked; while the mines will be among the most valuable in our northern territory.

It is possible that some additional supplies may hereafter be had from China. Before this can be expected, however, material changes must take place in the condition of affairs in the Chinese Empire. Little is really known about the Chinese tin mines, which are in a part of the country far from foreign influence, and not likely to be opened soon.

The conditions above noted—the limited supply and the absence of surplus stocks—combined with the impossibility of obtaining accurate statistics of production, have made the market for tin a highly speculative one. It is comparatively an easy matter to hold back supplies and to cause temporary scarcity. The result is seen in frequent fluctuations of prices and the uncertainty as to future dealings. The speculation in the metal is usually carried on from London to Amsterdam, though some of it is not unknown in New York. Recently, however, it seems that some of the Chinese operators, who control, directly or indirectly, mining in the East, have realized their power. The recent rise in quotations is attributed largely to Chinese speculators, and their holding back of ore supplies from the smelters. Success at this time will doubtless lead to other similar movements in the future.

MARKET CONDITIONS.

January 20.

The metal markets still remain comparatively quiet, although a firmer tone is generally manifested, and business is quietly improving.

Trade in copper has not been very heavy. Domestic consumers appear to be holding back, although they are carrying light stocks, and only purchases to cover immediate necessities are made. Apparently there is a desire to enforce a reduction in prices, if possible. Foreign consumers, on the other hand, having bought very freely, are now pretty well stocked up at the low prices for the present. Exports have been very heavy so far this month, and the January record will probably exceed that of December.

Tin has shown no material changes, although the speculative movement continues, to some extent. The question of tin supplies is considered in another column.

Lead has been active, with consumption evidently on the increase. In view of the large demand and the scarcity of spot metal, prices have advanced about $3 a ton early in the week; while to-day a further advance of $2 per ton is recorded, making $5 in all for the week.

Spelter is decidedly firm, the demand for the metal from galvanizers being unusually large for the season. In the Joplin ore market, prices have been somewhat higher, and the demand for the better grades of ore has been large.

Silver has shown some change. Demand from the East continues fair, and the general prosperity of India is reflected in buying of the metal for private account, as well as for coinage. The prospect of war in the East has so far affected the silver market but slightly. Late in the week the stoppage of purchases for coinage, by the Indian government, caused a sharp fall. It is believed, however, that this is only temporary, and that buying will be resumed before long.

The expected improvement in the iron trade comes rather slowly, but there is generally a firmer tone shown by the reports, with an increased demand for material. In pig iron, however, this is confined chiefly to foundry and gray forge, little having been done in bessemer or basic iron. In finished material, there has been more demand for structural material and plates; this is shown chiefly by inquiry, however, as few new orders for large contracts are reported. Some demand for bars is developing from the car-builders. The deadlock in the rail market continues, and no business at all is being done.

The western coal markets show heavy domestic demand, owing to the very severe weather. The steam coal trade is also improving, more factories have started up. The miners' convention to formulate demands on the operators for the coming year's contracts is in session this week. It will be followed by the joint convention to settle bituminous mining scales, which will meet January 28, in Indianapolis. It seems certain that the miners will demand an advance in the mining rate probably of 10 cents.

Conditions in the Atlantic seaboard bituminous trade continue practically unchanged. Demand shows little improvement, and the receipts of coal, in spite of weather conditions, are sufficient. Nothing has been done on contracts for the coming year, and the outlook is that many consumers may decide to buy from hand-to-mouth instead of contracting.

In the anthracite trade demand is better, continued cold weather having greatly reduced supplies in the hands of consumers. The coastwise movement of coal has been greatly hampered by stormy weather and by ice in eastern ports.

METALLICS.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

The deepest ore obtained from the Comstock was extracted on the 3,200-ft. level of the Savage mine.

Many drawings of geological cross-sections are lovely looking colored sinuosities which convey a totally misleading idea of regularity and continuity of rock structure. It is always well to mark the distinction between a diagram and a drawing—one is based largely on constructive imagination, the other should be founded entirely on fact.

Argentiferous lead ores in Utah were first discovered in Little Cottonwood cañon in 1863. Thirty-nine years later (in 1902) the State produced 55,305 short tons lead and 10,831,700 oz. silver.

On January 19, 1848, Marshall discovered gold at Coloma, Cal., which started the rush of gold-seekers to the Pacific Coast. In 1849 the yellow metal was found in Gold cañon, Nevada. This was an important event, as it led to the discovery, in 1850, of the Comstock lode, inaugurating a great era of mining activity.

It has been found that a chrome-nickel steel, carrying 75 per cent chromium and 25 per cent nickel, if worked into armor plate, acquires, by being merely tempered, a superficial hardness equal to that given by the Harvey process.

The quality and grade of steel is governed by the heat treatment to which it is subjected, as well as its chemical composition. Its structure may be radically changed by heat without altering its chemical composition.

Steel may be rendered crystalline and its strength destroyed by overheating, and it is restored to its greatest strength and toughness by heating to the critical point required.

An alloy of iron with 36 per cent nickel is so slightly susceptible to expansion from heat that the expansion can scarcely be measured by the most delicate instruments.

Powder can be safely thawed by placing it in an enclosed box with a can of hot water. One can of hot water placed thus has been found to keep the powder soft for 12 hours.

The English language is suffering violence in many ways. Among those who are forgetting its grace and beauty, the elements of its power, and the right use of it, are the students of pure and applied science, who, being eager in youth to get at their work directly, despise such mere scholastic accomplishments as rhetoric, grammar and logic. The result often is that, when they have discovered something which they are eager to give to the world and which the world ought to know, they have no vehicle of language and style worthy to convey their noble facts and great ideas to the public.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the ENGINEERING AND MINING JOURNAL.

TREATMENT OF SULPHO-TELLURIDE ORES.

The Editor:

Sir.—Traveling in Australia has delayed my receiving your issue of October 3, containing Mr. Argall's letter on 'Wet-Crushing Bromo-Cyaniding versus Dry-Crushing Roasting for Telluride Ores.'

Having long entertained strong prejudices concerning the character of discussion proper for technical journals, I must refuse to enter that form of it toward which the discussion is rapidly drifting, which consists entirely of repetition and partial quotations from former communications, without presenting new information to the profession. If the discussion is to continue, I would like to stick to the original statement of Mr. Argall which I have called into question, that "dry-crushing roasting processes will ultimately prevail at Kalgoorlie," although Mr. Argall has kindly admitted that he is not familiar with Kalgoorlie conditions. Assuming that Kalgoorlie dry-crushing and roasting mills are possibly not the best practice of that form of treatment, as Mr. Argall intimates (to which I take exception), and in order that the discussion may bring to light useful information, if Mr. Argall will give the detailed costs of two or three Cripple Creek mills, to show upon what his assertions are founded, he will have answered my last letter; and if he will do so I will contribute further costs from all the wet-crushing mills at Kalgoorlie treating the richest ores as well as low-grade ores of the field, and will contribute them upon any basis of allocation which Mr. Argall will suggest. In order to get competent comparison of the matter under the differing conditions, it will be necessary to show the horse-power used on a 'per ton' basis, and the cost of horse-power upon a 'horse-power' basis, together with total hours of labor employed on 'per ton' basis, and the cost of labor per hour. The matter of supplies will require similar comparison. H. C. HOOVER.

Melbourne, Dec. 1, 1903.

THE JOPLIN DISTRICT.

The Editor:

Sir.—I read with much interest the reviews of the zinc and lead production, which were published in your number for January 7. While I appreciate the great value of these reviews, I regret very much, as do many others, in this district, that Mr. Ingalls should seem to show an aversion, or at least a low appreciation of, the district. I am like many others, a strong admirer of his writings, and can hardly understand this feeling. Thus, Mr. Ingalls points out carefully that the exportation last winter was a failure, which is true if we take the point of view of direct profit; but he fails to show that this disposition of the surplus ore had a great effect upon later prices. A similar effect often follows similar movements in any line of business. It is a result of the fundamental law of supply and demand.

Another point Mr. Ingalls overlooks is that, during the past year, the mines have been consolidated into fewer hands—a process that is still in progress. There are now many instances in the district where the land-owner, or first lessee, has the sale of all the ore mined on his tract; so that the selling interests are consolidated, even where the mining interests are not actually so held. Thus, the Nicholson interest now control an output of 450 to 500 tons per week; the Luke & Brown about 400 tons; Holmes, Cape & Rogers, 350 tons, and the Troup Consolidated an equal amount; while the bulk of the rest of the output is controlled in lots of 100 to 200 tons each. There are as many mills as heretofore, but one line of interests controls a number of them.

This centralization of control of the output makes it possible for a sufficient tonnage to be represented in any movement to regulate the surplus of ore. The estimate of cost, given in your review of the Joplin district on January 7, was $26 to $28 per ton; but such a statement covers only the best equipped and best managed mine. Mr. Nicholson's average of $30 per ton, as average cost, is much nearer the general run. ZINC MINER.

Joplin, Mo., Jan. 15, 1904.

SULPHIDE SMELTING.

The Editor:

Sir.—It is with pleasure that I add my mite to the discussion on sulphide smelting which is proceeding in your columns, and which I have followed with interest and profit. Let me say at first that I am in accord with you in your endeavors to find a more suitable designation for this art than the somewhat unfortunate one under which it now labors. I do not know how, or by whom, the name 'pyritic' smelting was first attached to it, but, if the usage of the last ten years has not fixed it too firmly in the popular mind to allow the substitution of a better, I consider that your attempts are well-timed and worthy of support. The name 'sulphide' smelting has always seemed to me to be the most suitable designation, it having been used first, as far as I know, by Mr. Austin some ten years ago. A year or two later I used it in my little book, 'Matte Smelting,' but expressed a fear then that the other name was too firmly fixed to permit of a change. In this connection, allow me to say that I see no sufficient reason for the use of the prefix 'raw,' which you have chosen. "Raw sulphides" are simply sulphides, and nothing more. Any reader of a metallurgical article may surely be assumed to know that cooked (roasted) sulphides are no longer sulphides, but oxides. As a metallurgical word, raw smacks of its German origin, but in ordinary language the reader would be more apt to connect it with beefsteaks than with ore.

While dealing with the terminology of the science, I desire to suggest the use, among copper and lead smelters, of the word 'stock,' so much in vogue among iron metallurgists. We are in the habit of using such expressions as furnace mixture, furnace charge, ore mixture, to express the aggregate of what is put into the furnace. The one word, 'stock,' which to me has a fine old English ring, covers the ground much better. I have never noticed its use in this connection, in other than iron metallurgy; so, considering the scope of the word and the accuracy of its meaning, I think it would be a useful addition to this branch of the science.

1. *What Types of Ores are Suited to the Process?*—If I were to be permitted, I would modify this question to read, What kind of ore mixture is best suited to the process? For it makes no difference what the ores are, provided that their values are in gold, silver or copper, and that they do not contain lead which it is an object to save. One ore is as well suited to sulphide smelting as another, provided that it be smelted along with other ores or fluxes which make up its deficiencies as a builder of slag and matte and a furnisher of heat. It is, therefore, a question, not of the composition of individual ores, but of the mixture of ores and fluxes which we get together and throw into the furnace. While an unlimited number of ores and mixtures can be very well smelted in the sulphide furnace, the mixture best suited to the process would consist of iron pyrite, copper in some form, it matters not what, silica, at least partly in the free state, and lime in the form of calcite. Each of these substances may be replaced with many others without much detriment to the practical work of the smelter, but there are reasons why these particular minerals are the most favorable. Thus, iron pyrite may be replaced with pyrrhotite, the magnetic iron pyrite; but the former, while doubtless containing less iron, which is the combustible *par excellence* of this process, discharges its sulphur with more ease, thus getting rid of a good proportion of its weight with but small expense to the smelter for fuel and blast. Calcite, again, while containing much lime, which is extremely useful inside the furnace in a variety of ways, still contains much carbonic acid, which, as everyone knows, is easily gotten rid of by merely heating, and, like sulphur, has no noticeable effect in increasing the expenditure of fuel. The volatile ingredients of the smelting mixture, which pass out of the smoke-stack instead of entering the slag and requiring an expenditure of fuel to fuse and of labor to remove, are in one sense a help to a process instead of a detriment. Among these is water, and particularly arsenic, both of which are evolved with ease. Aside from its tendency to cause losses of the precious metals, arsenic, so long a bugbear to other processes, may be in time regarded as a favorite for the sulphide process, on account of this easy volatility. I am not certain that in the list of desirable substances for this method I should not put mispickel at the head, in place of iron pyrite, if it be a question merely of the economical elimination of ore constituents.

Without detriment to the results, there may be oxidized iron and manganese compounds in the stock, as well as any kind of silicate minerals that do not contain undesirable bases. It is not necessary as some think, that the stock should contain a preponderating amount of sulphides with merely enough silica to flux the iron that may be burned. We do not, indeed, feel the advantages of the process until we have occasion to smelt stock which, containing but a moderate amount of pyrite, is so constituted that a high concentration is practicable. In such a case we may perhaps gain more by the high concentration than we lose by having to apply more coke fuel. This feature was first brought out by Mr. Austin in the early days of the process, but does not yet seem, even now, to be fully appreciated by those who practice it.

Under all circumstances (as I believe) the sulphide burning furnace makes a slag in which all the lime, excepting that small part that

may become dissolved in the slag as sulphide, combines with the silica as bi-silicate. The lime apparently is first taken up by the silica to the exclusion of the metallic bases—iron, zinc and manganese oxides—leaving these to be thereafter satisfied so far as the silica goes. When lime exists in stock containing iron only as sulphide, the proportionate quantity of silica requisite to form the bi-silicate is first united with the lime, when the remainder of the silica, aided by heat and oxygen, burns enough of the iron sulphide to produce the quantity of iron oxide to flux the remaining silica and no more. The residue of iron sulphide will remain undecomposed, and will enter the matte. It does not appear that any of the native silicate minerals which we find in ores affect the iron sulphide during the smelting, and it would probably be useless to add them to the stock in the expectation of their assisting the vital reaction of decomposing the melted sulphide. They may, of course, be smelted incidentally to the process without assisting in its characteristic reactions. This is true, I believe, of garnet and hornblende, and of the alumina silicates, many of which are so common in ores, particularly in those of copper.

2. *Is Hot Blast Advisable?*—My later experience is altogether favorable to the hot blast. I believe that every matting blast, furnace plant should be, and in time will be, supplied with this useful auxiliary. It is true that hot blast complicates the plant, increasing its initial cost and the expense of running; but I believe that it invariably decreases the cost of treating the ore. At least, I do not know of a single plant where it has not done so if used. When the pyritic process was first advocated, many mistaken ideas were prevalent as to the functions of the hot blast. Some maintained that the process could not go on without it, holding that the previous heating of the air was a *sine qua non*. It is said that I was the first to demonstrate that there was such a thing as cold blast pyritic smelting, which is something that we see going on every day now. This unimportant fact, which I hope to be excused for citing, does not blind me to the advantages of heating the blast which I have long been in the habit of advocating. As I see it, the heating of the blast assists in different ways. First, it saves fuel (question 3); this cannot be denied by even the most hidebound of our opponents, if we have any opponents at this late day. Second, it makes the furnace drive faster and smelt more in a day. This may be and has been disputed, but I maintain it in the face of the assertions to the contrary, which come from high sources. In my personal experience such has always been the case. I have studied the process closely for a dozen years and more, and have never missed an opportunity to investigate its peculiarities; and I repeat that, under all circumstances with which I am familiar, the hot blast has increased the rate of driving very materially. It is natural that it should do so, for, as less fuel is required, the lessened amount will be consumed quicker and will permit the descent of the charges much faster, this resulting directly in increasing the capacity of the furnace. It takes a certain amount of time and of air to burn coke, and the more coke the more time and air. This is demonstration enough for the ordinary man, and when I add to this the observed fact that the furnaces that I have known actually run faster with hot blast than with cold, I feel that I have had my say.

At a time when metallurgists had at command no other apparatus for blast heating than the cumbersome old cast-iron pipe-stoves of a past era, hot blasts were not so often advisable. The stoves of which I speak were adopted bodily from the iron regions of the East, and had three defects, which rendered them ineffective to a great degree. They were extravagant in first cost; they impeded the blast; and, finally, they were very inefficient in the matter of heat transference. Stoves of this pattern are known to impede the blast in its passage to such an extent that the pressure at the blower commonly registers from 6 to 16 oz. more than at the tuyeres, showing a great loss in power and pressure. The cause is that the passages are much too tortuous and constricted. The apparatus is usually gotten up on the original plans of some extinct iron works, without any alteration to fit it to the much lower pressures used in copper smelting. I do not know that anyone has ever executed tests showing the heat applied to and returned by such stoves, so I cannot speak from accurate knowledge; but I do not imagine that any such stove has an efficiency of more than 50 per cent, if as much. With such apparatus as this, it is no wonder that operators have sometimes felt that the hot blast was not always advisable. I notice from the lately published reports of the operations at Mt. Lyell that the stoves there, when heating the blast to 500° F., had an efficiency of 49 per cent., according to my own estimates, based on their data, and assuming an average calorific power for the wood with which they are heated; and that they retarded the blast to the extent that the pressure at the furnaces was 6 oz. per sq. in. below that at the blowers, thus consuming about one-sixth of the power applied to the latter. Surely, there is no reason for the tone of gratulation in which interested parties speak of the performances of those particular stoves.

3. *To What Extent Can Fuel be Eliminated?*—The saving of fuel in the process under consideration varies much with different charges and conditions. Unless we use the hot blast, there is no saving of fuel in particular. With it, we save from one-half to two-thirds of what would be used without it. Thus, if the charge required 10 per cent of coke to smelt with the cold blast, it would probably require from 3 to 5 per cent with the heated blast. This would depend somewhat upon the composition of the charge, and especially as to its contents in sulphides, which furnish the principal fuel. One smelter that I know of is regularly treating sulphide mixtures with 6 per cent of coke with cold blast. While his stock is well adapted to hot-blast smelting, it is not possible to save much fuel by its aid, the present consumption being so small. In all such cases where, with cold blast, a low fuel consumption is claimed, we must expect to find a quite low degree of concentration. Such is the case at the works of which I speak. Cases are known where no carbonaceous fuel at all is used, the whole supply of heat arising from the combustion of sulphides and from the hot air blown in. The latter source of heat may also be eliminated, it is claimed, and the sulphides relied upon solely. It is said that at Mt. Lyell, where for years they heated the blast to some 500° and a little more, the tendency now is to blow harder and heat the blast less, and rely almost entirely on the combustion of the sulphides for the heat. We cannot tell to what these new experiments may lead; but it is hardly in the line of economy to spend much money on a heavier blast without first inquiring if the useful effects of a hotter and lighter one may not be preferable and had at a cheaper rate.

4. *What Amount of Copper is Necessary for the Collection of the Precious Metals?*—This question refers, I suppose, to the quality of the matte which is produced. The aggregate amount of copper in the ore would not be a pertinent matter. It is the richness of the matte that tells the story. I have always found a matte of from 30 to 50 per cent of copper to give the best results in a high percentage of savings of the gold and silver. Others have had a different experience, and some even claim that copper is unnecessary in the matte. My impression is that, if the slag accompanying the matte be largely composed of lime or magnesia, the iron matte without copper will serve as a collector; but that with a heavy iron slag, such as falls when the charge is high in pyrite, a coppery matte is essential. It really requires but a very little matte to extract the values if it be of the right sort; nor have I found a large proportion of matte of whatever composition, to have any effect in reducing the slag losses. A singular notion is prevalent among several metallurgists who have addressed you of late. They appear to think that successful smelting cannot be done unless a certain proportion of matte be made, some putting the quantity as high as 10 or 15 per cent. One says that the tuyeres get dark; another, that the hearth fills, up, etc., etc. The small proportion of matte, indeed, is not without its influence on the working of the furnace, but even if the matte-fall ceases entirely the smelting will proceed, perhaps unchecked. Let me ask such operators if they can smelt charges of slag alone, where no matte is produced; or if they have ever tried to handle mixtures giving a concentration as high as 20 and even 40 to one.

Question 8, which asks what percentage of lime is necessary to a clean slag, leads naturally to a wider question of the influence of lime on slag losses. Lime is exceedingly beneficial in the furnace for three reasons at least, which I may dwell upon. In the first place, the lime slags of the composition indicated before, wor kextremely well in the blast-furnace. They run very nicely, with a smooth, oily flow, do not sputter, and keep the furnace and its accessories in first-rate condition. They are light and reasonably fluid, and allow the matte globules to settle out most perfectly. Any, even the slightest, iron matte will settle from high lime slags. It seems to me, when I consider the behavior of these admirable substances, that a pure bi-silicate of lime would have no action at all upon entangled sulphides. The expression "clean slag" is a relative one. There is no such thing as a slag entirely free from gold, silver and copper; but I think that the lime slags come nearest to absolute cleanness. Of all such slags, those containing nearly an equal amount of bi-silicate of lime and singulo-silicate of iron behave the best, all things considered, and will be as clean as we can get. Lime is not often a constituent of sulphide ores, so that we can hardly expect it to enter largely into slag composition in this form of smelting; nor is it entirely necessary that it should. Quite acceptable slags are made with iron oxide as almost the sole base. I have made such, and, regarding their freedom from valuable metals, I recall that the average percentage of copper carried off by

them at one works was nearly ½ per cent, which is probably twice as much as a well-constituted lime-iron slag would have shown. However, under the existing circumstances, this result was good. It would not have paid to add lime to such a slag unless it could have been had in the form of a paying ore, which at that locality was impossible. Speaking generally, and without reference to particular localities, I should say that it would never pay to add lime to pyritic charges when iron in any form can be had at less cost. On the other hand, it would never pay to add iron oxide as flux when lime ores can be had at less cost, provided that the percentage of lime does not surpass 30 or thereabouts; for a slag containing much above this percentage will not melt properly in the cupola.

The degree of desulphurization in the furnace, depending as it does upon a large number of factors, is very variable. When the stock consists mainly of heavy pyritous ore, where it is not practicable to flux highly with silica, the proportion of sulphur expelled will be small, perhaps not more than 60 or 70 per cent. When the ores contain many other bases than iron, and especially when they contain much lime (and probably magnesia), mingled proportionally with silica, the combustion of sulphides is more extensive, and frequently ascends to 80 per cent and more. When treating charges of mixed ores, oxides and sulphides with a sulphur content of 8 or 10, I noticed that 75 per cent of the sulphur was expelled. Mixtures carrying 26 to 28 per cent gave the same result, but would have lost more had the fluxes been suitable for the work. On another occasion, when smelting a mixture containing some 11 per cent sulphur, the percentage driven off reached the extraordinary figure of 96 per cent. The result in this case was due, in my opinion, to the two concurrent facts that the ore carried nearly as much arsenic as sulphur, while the flux consisted of a large proportion of lime, which is observed to influence the expulsion of sulphur—and hence concentration of the product—in a very favorable manner. The arsenic, as I observed, was largely sublimed in the form of a sulphide, and to this I mainly ascribe the good results obtained during the smelting. Others have noticed that at certain times, depending on the condition of the furnace, all the sulphur may be burned off from charges low in that element.

10. *What Is the Relative Economy as Compared with Rival Processes?*—This question I find most difficult to answer. In fact, I do not think that it can be satisfactorily answered in general terms. It would be necessary to study the conditions that surround each individual case in order to form a judgment as to the applicability or economy of this or that process. As I have heretofore said, there are no ores whatever of silver, gold or copper which may not be treated by sulphide smelting if the stock be proportioned right, but there are thousands of cases where some other process may prove more economical. In the matter of general availability, there is no doubt that sulphide smelting has a great advantage over all others. Again, it is advantageous in that no process requires so little preliminary preparation of the stock. Even the huge iron furnace, apparently omnivorous, is not able to gorge and digest the heterogeneous elements which may with perfect success be fed into the sulphide smelter. This fact makes, of course, for economy in running, and particularly for the general usefulness of the process. The plant itself is cheap and simple, and if well constructed is at least as reliable in its work as the lead process or any other well known method. I have noticed, however, a tendency to put up cheap and trivial plants, which is much to be regretted, as it will inevitably tend to retard the development of the process.

In considering the merits of a process, we must not blind ourselves to its disadvantages. The principal drawback of sulphide smelting, by which its economy is much lessened, as compared with other methods, lies in its production of a crude and comparatively unfinished end-product, which is not only heavy and burdensome to handle and transport, but requires costly and complex operations to bring it into useful form. The same is true of the ordinary or plain matting processes. As compared with these, such methods as chlorination and amalgamation, whose end-product is salable at the mine, have an advantage which must not be overlooked. As regards the cost of treatment, now one, now another process has the advantage; but as a matter of fact the improvements of late years have brought down the cost in all the standard processes to so low a pitch that there is often not enough difference between them to incline the judgment either way. It would seem that nobody is building plants nowadays with the expectation of their costing over $3 or so per ton for treating the ore or stock. I speak now of the larger establishments, which are springing up so numerously on our western hillsides. In forming our ideas in the matter of costs of treatment, we must not omit to discriminate between the amount and character of the preliminary preparation required to fit the ore to the process to be applied, and which frequently makes quite an item to be added to the total of expenses, although in this comparison I have not considered it as belonging strictly to the process. Thus roasting is in no sense a part of the lead-smelting process, but is sometimes a necessary preliminary thereto, as it is to chlorination in most of, if not quite all, cases, and to cyanidation in many.

Comparative Table.

Process.	Preparation.	Product.	Extraction.	Cost per ton.	Cost of plant per daily ton.
Sulphide smelting	None	Crude matte	Almost complete	$2—$4	$200
Reverberatory matting	Crushing, roasting	Crude matte	Same	Same	300
Lead smelting	Roasting	Lead bullion	Same	3— 5	300
Chlorination	Crushing, roasting	Metallic gold	90(?)	4— 7	400
Cyanidation	Same	Same	60—80	3— 5	400
Stamp milling	Crushing	Gold bars	70—85	1— 2	150

Numerous instances have been cited in print where the cost of treatment has been brought as low as $2 per ton, and in the case of matting and stamp amalgamation to $1. What wonderful progress these facts indicate! I well remember the time when men went broke trying to smelt for $50 and $100 per ton.

I have endeavored to collect in tabular form the differences between certain processes, as an aid in solving the question which you have asked. The statements have no claim to accuracy, but may be of use in the comparison which is involved in the answer. The last column is intended to approximate, under ordinary conditions, the initial cost of building an ordinarily substantial works per ton of ore or stock to be treated daily.

HERBERT LANG.

Oakland, Cal., Dec. 7, 1903.

A BUREAU OF MINING.

The Editor:

Sir.—Your editorial on the subject of the United States Geological Survey is most timely, and should appeal to all engineers in the field, as well as to all those engaged in mining enterprises.

Undoubtedly the Survey covers a great deal of ground, and I do not presume to criticise or suggest along lines other than those which I myself have followed. It seems to me that the *raison d'être* of the Survey, as originally conceived by Mr. Clarence King and the founders of the Geological Survey, has been somewhat obscured by the many demands made upon it for work which should be confined to other departments of the government.

The main object of the Survey, when established, was, as I understand it, geological reconnaissance of metalliferous as well as other deposits, so that their economical value could be more clearly understood and developed by the citizens of the country. How this can best be carried out is, as you suggest, through a Bureau of Mining, which could more particularly take up the work by the issue of prompt information covering the metalliferous deposits of the West. As an illustration: If the Leadville portfolio (more particularly the work of Mr. S. F. Emmons) had been more promptly published, much valuable time and some money would have been saved in the development of that district.

It has appeared to me that a great deal of unnecessary time and attention has been given to the Survey for work in sections which were not active or especially productive.

It would seem wise, considering the enormous territory which it is necessary to cover, that the work of the Survey should be arranged, that by hard and fast lines covering the country section by section, but that those sections or portions of the country should be taken up in which there is active exploration going on. I have known of the Survey having men in the field in sections of the country which presented no especial interest to either the investor or the engineer.

There is also a great deal of important work to be done in the field of useful products, such as gypsum, salt, phosphates, and the like, upon which the government has little or no information to give. This is especially true of the gypsum deposits, which, during these last few years, have been developed in the State of Iowa. I can find no data upon these deposits which are of any especial value, although this district is now shipping almost 1,000 tons of gypsum daily. Salt deposits have likewise been much neglected, and in both cases the Survey could, with a very small expenditure of money, segregate those sections of the country favorable to the occurrence of these products. Deposits of salt similar to those in Germany undoubtedly exist in this country, and a splendid opportunity is offered to the Survey to take up matters of this kind, which are of great importance commercially.

It seems to me that data covering geological information, which is of the greatest import-

ance in economical development of mines, should be issued promptly. This plan could be carried out in a general way along the lines pursued by the Institute of Mining Engineers, in issuing the advanced information before the papers are finally distributed in book form; in other words, the pamphlets covering the more important information gained by geological work could be distributed to people interested in the special districts covered by the reports.

By working in harmony with State geological surveys much good can be accomplished. Why not suggest to the powers in Washington the appointment of a commission to go into the plan and scope of the Survey? Let this commission be chosen from the members of the Institute of Mining Engineers.

BENJ. B. LAWRENCE.

New York, Jan. 17, 1904.

The Editor:

Sir.—I have read your valuable editorial on the establishment of a mining bureau under the auspices of the Geological Survey. This plan appears to me much more feasible than the establishment of an independent bureau or department of mines, since the survey already has an excellent corps of trained economic geologists. It is only necessary to unite these into a separate division under the guidance of a capable engineer like Mr. Emmons, and to give this division or bureau adequate appropriations. Increased funds would mean the addition to this corps of young mining engineers, to be specially trained for economic geological work. It would seem likely that the establishment of such a bureau would receive the sanction and support of the director, Mr. Walcott, who has, I think, always regarded the Survey as an institution whose principal object should be to supply the people with reliable information of practical benefit. We have only to refer to the director's paper presented at the Washington meeting of the American Institute of Mining Engineers in 1900[1] to see that his idea of the proper scope of the Survey work in economic geology and its limitations practically corresponds with the suggestions outlined in your editorial. Mr. Walcott states:

1. That the Survey should endeavor to accomplish for the mining industry what the individual mining engineer cannot do; as, for example, the special investigation of an entire mining district.

2. That it should not undertake to do what can be done as well or better by the individual; as, for example, the prospecting of a new region for ore-deposits.

3. That it should not interfere with the private business of individuals or corporations. Thus, while the Survey should endeavor to give the public reliable data as to the value of mining districts and their future prospects, no opinion as to the value of individual properties is permissible, this being the province of the mining engineers.

4. That it should not make assays or analyses of ores for private individuals or corporations.

5. That it should not, as a rule, take up the technical side of mining, such as methods of ore reduction.

[1] 'The Work of the United States Geological Survey in Relation to the Mineral Resources of the United States.'

That the Geological Survey is at present encumbered with work which does not properly belong to it, is well known to many of its friends.

Since the President, in his last message, has recommended that the forestry work of the government should all be consolidated under the Agricultural Department, where it properly belongs, it is likely that the Survey will be relieved of this branch of its service.

The subject of the irrigation of the public lands and the reclamation service is likewise appropriate to the Agricultural Department; yet the survey of these lands and of reservoir sites needs specially trained engineers, such as have been supplied by the topographic division of the Survey; then, again, the study of the underground waters belongs evidently to the geological corps.

In a general way, all of the publications of the Survey, even those on paleontology, may be considered of practical value. The greatest discoveries of economic importance have not, as a rule, been made with a view to their private practical application, but during abstract scientific investigations.

The reconnaissances of new regions like Alaska and the folio work are extremely useful to intelligent engineers looking for properties to develop. They give pertinent information that the mining engineer could only acquire after months or years of continued labor.

The special investigation of mining districts, even when these appear as obituaries, are of particular value to the engineer or mine-owner, inasmuch as they give the best data obtainable for use in forming a judgment of the probable future and mode of occurrence of similar ore-deposits elsewhere. H. W. TURNER.

San Francisco, Dec. 23, 1903.

THE CANADIAN MINING INSTITUTE.

The annual general meeting of the Institute will be held in the King Edward Hotel, in the city of Toronto, Ontario, on Wednesday, Thursday and Friday, March 2, 3 and 4 next. The announcement is made in a circular from the secretary, dated January 15, and is sent out at this early date in the hope of securing a large attendance at the meeting. The usual arrangements for special rates on the Canadian railways have been made. Arrangements are under consideration for an excursion of the members to Niagara Falls on Saturday, March 5. Facilities will be provided them for inspecting the power plants, electro-metallurgical and other works which present great interest to engineers. The annual dinner of the Institute will be held in the King Edward Hotel on the evening of March 4.

The following is a preliminary announcement of the papers so far promised for this meeting:

1. Presidential Address; Eugene Coste, Toronto, Ontario.

2. Hydraulic Mining in the Yukon, its Present and Future; Lucien J. Robe, Dawson, Yukon.

3. Evolution of Mining Practice in the Yukon; A. J. Beaudette, Dawson, Yukon.

4. Exhibition of Lantern Slides Illustrating Mine Practice in the Yukon and the Cariboo Gold-fields; B. T. A. Bell, Ottawa.

5. Construction of Mine Bulkheads; W. Thompson, Rossland, B. C.

6. Gold Dredging; John E. Hardman, Montreal.

7. Certain Conditions of Coal Mining in the Crow's Nest Pass, British Columbia; James McEvoy, Fernie, B. C.

8. The Bornite Ores of British Columbia and the Yukon; W. M. Brewer, Victoria, B. C.

9. Nickel Deposits of Norway; Major R. G. Leckie, Sudbury, Ont.

10. Electric Smelting of Iron Ores; Dr. Eugene Haanel, Ottawa.

11. The Geological Survey of Canada as an Educational Institution; Prof. T. L. Walker, Toronto, Ont.

12. Opening Up and Development of Mines; D. G. Kerr, Cordova, Ont.

13. Undeveloped Mineral Resources of Ontario; W. G. Miller, Toronto, Ont.

14. Manufacture of Sulphuric Acid; C. A. Meissner, Sydney, Cape Breton, N. S.

15. The Mines of Ontario (illustrated by lantern slides); W. E. H. Carter, Toronto, Ont.

16. Genesis of Animikie, Iron Range; F. Hille, Port Arthur, Ont.

17. Magnetic Separation; F. G. Snyder, Chicago, Ill.

18. A Year's Progress of Mining in Ontario; T. W. Gibson, Toronto, Ont.

19. Water Supply for Hawaiian Plantations; I. N. S. Williams, Puunene, H. I.

20. Early History of Mining in the Sudbury District; J. W. Evans, Deseronto, Ont.

21. Carboniferous of New Brunswick; Dr. H. M. Ami, Ottawa.

Papers have also been promised, on subjects not yet announced, by Frederick Keffer, Anaconda, B. C.; A. C. Garde, Sandon, B. C., and E. B. Kirby, Rossland, B. C. Further details will be announced in a later circular.

THE NEW PATENT LAW IN AUSTRALIA.

The parliament of the Australian Commonwealth has passed a new patent law covering the six States. According to the new law, patents are to be granted for 14 years; examination as to novelty is to be made to a limited extent; actual working of the invention within the Commonwealth is not necessary, but compulsory licenses may be granted after two years to any person proving that the reasonable requirements of the public have not been satisfied; additional patents are provided for at half fees; a patent is valid as to all good claims, notwithstanding it may contain one or more invalid claims. The cost of a patent under the new law to cover the six States will be about one-sixth of the cost of taking out patents to cover the same area at the present time. A fee of £5 is payable before the actual issue of the patent and a renewal fee of £5 before the expiration of the seventh year. Existing patents may be converted into Commonwealth privileges for their unexpired period.

SHIPBUILDING IN THE UNITED STATES.—The total number of vessels built in the United States in 1903 was 1,159, the total rated burden being 381,970 tons. This showed a decrease of 163 vessels and 47,357 tons rating. The larger number of vessels were built on the Great Lakes, over 65 per cent of the total tonnage being credited to that district.

THE OUTLOOK FOR MINING IN THE NEW TERRITORY OPENED UP BY THE SAN PEDRO, LOS ANGELES & SALT LAKE RAILROAD.—I.

By M. S. Duffield.

In company with two other mining engineers the writer of this article left Salt Lake last winter in a covered wagon, similar to the wagons commonly used by sheep-herders, and followed the proposed route of the San Pedro, Los Angeles & Salt Lake Railroad to where it crosses the Santa Fe system. The mining possibilities along this route were carefully investigated, side-trips of over 60 miles at times being made to visit districts that will necessarily be tributary to the new road. Much information was obtained in this eight months' trip, and some of it will be of interest to the general mining public.

The stretch of railroad from Salt Lake City to Modena, about 350 miles, was originally built by the Oregon Short Line, and within the last two years was extended, first to Uvada, on the boundary separating Utah from Nevada, and then to Kalientes, in Lincoln county, Nevada, the present terminus. In the territory through which the road is thus far completed the camps of Stockton, Tintic, Mammoth, Milford and Frisco are too well known to be dwelt upon here. Tributary to Modena is the less-known district of Stateline, where some promising prospects are being developed. Modena is also the railroad station for St. George, on the Rio Virgin, near which place promising copper properties are being developed in spite of the lack of facilities for cheap transportation.

The principle prospect in the St. George district is the Apex, or, as it is commonly called, the Dixie mine. A small smelter is running on ore from this mine, and a string of wagons, hauling coke one way and matte the other, is kept on the road between Modena and Shem City, as the Mormons have named the smelter town. Near Modena, also, there will be a junction station, for the iron deposits of Iron county, near Cedar City, just north of St. George. Ely and the districts of White Pine county will probably remain tributary to some point on the railroad between Modena and Milford.

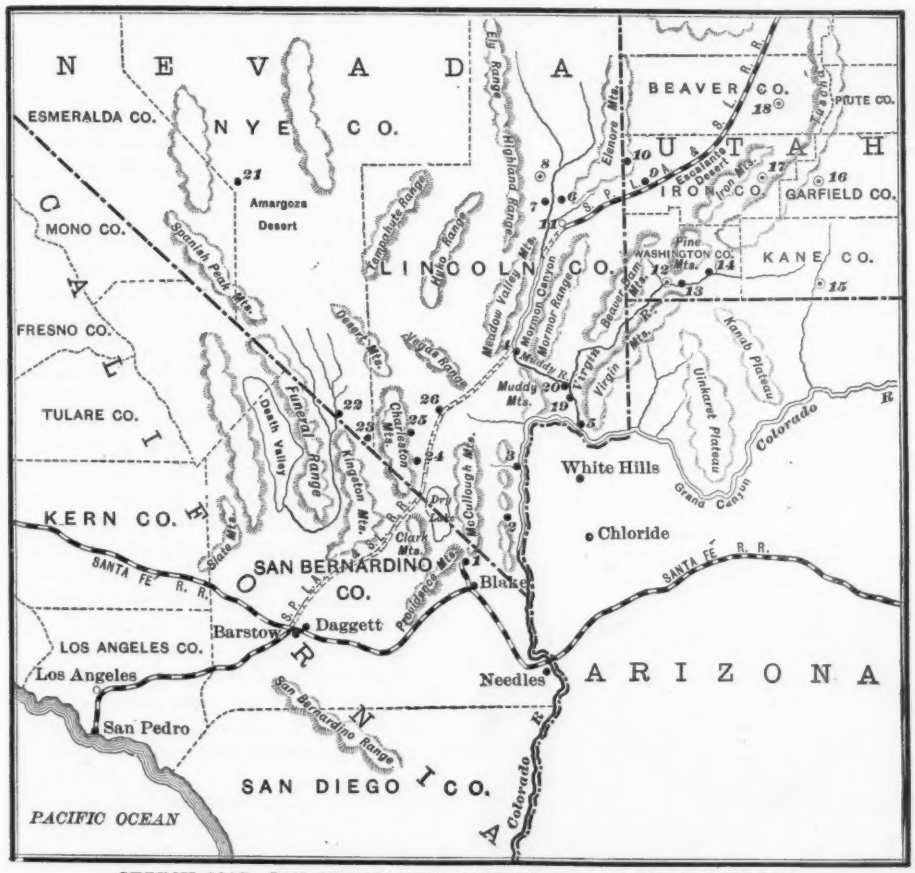
The country opened up by this new road, as far as its present terminus, may fairly be called a well-prospected country. Of course, the writer realizes how little each one of the Utah camps considers its immediate vicinity prospected, and in using the word he bears this in mind. To put it conversely, it is not nearly so unprospected a country as that through which the new road will pass in Lincoln county and in southwestern California. The main settled regions of Utah have long been run over by prospectors, and the best showings of mineral have been investigated. All the country immediately tributary to the old Salt Lake and Pioche stage road was examined in the "palmy seventies," many of the ledges being abandoned as too poor; but, as conditions have improved, attention has been turned to the lower grade ores. Owing to the Mormon settlements that are scattered along the valley regions, wherever water for irrigation is obtainable, the mountains have been easily accessible to prospectors. And let me remark in passing that although the Mormon farmer has always been credited by the miner with being densely ignorant in matters mineralogical, he, nevertheless, possesses a much more acute interest in such things than he is given credit for. His riding into the range after strayed stock, his herding sheep, and his search for firewood and timber in the cañons has given him a knowledge of his own locality that the transient prospector never attains.

Geologically, the region of Washington and Iron counties, in Utah, and White Pine and northern Lincoln counties, in Nevada, partakes of the main structural features of the Great Basin plateau. The usual parallel north and south ranges are well represented. These "basin" ranges, as they are called, have been formed by block-tilting on a grand scale. They are very rugged and often present enormously disturbed strata of quartzites and limestones, with the intruded and erupted porphyries, andesites, felsites and diorites, so common in the old Utah camps.

Eastward, toward the Colorado plateau, which is generally demarked from the southeastern rim of the Great Basin by the Green river and its tributaries, the Paleozoic rocks in the mountain masses and the Mesozoic in the plateau-valleys give way, in geological importance, to Mesozoic strata. This feature marks a noticeable change, for near Eureka and also in the Uinta mountains, where the Green river has cut a channel across it, the Paleozoic is exposed in great strength, attaining 30,000 ft. in thickness. Even far south of the Great Salt Lake the Paleozoic strata attains a formidable thickness. This complete change is, after all, only what one would expect in approaching the edge of the Great Basin.

In Iron county, Utah, in the southern end of the Wasatch mountains, occur beds of magnetite and hematite extending over an area of about 7 by 18 miles. These deposits in the Iron mountains have long been known, and their development in the near future has been widely heralded as a result of the new railroad. An inferior coal is found not far from the mines, although coke will probably have to come from Carbon county, Utah. These beds of iron differed originally but little from the limonite ores that occur associated with eruptive rocks in Carboniferous limestone in the east Tintic district, and that are so commonly used as a flux by the lead-silver smelters. They are apparently metamorphosed limonites, and they occur in limestones of Silurian age, associated with a trachyte, which, with other eruptives, has upturned and altered the limestone, piercing it with eruptive masses. The trachyte is probably intimately related to that found farther east, along the Green River. The iron occurs in prominent ridges and the ore-bodies show the usual lenticular shape. The ores sometimes exceed the bessemer limit of phosphorus. In the Star district granite and quartzite are locally associated with the ore-bodies. Hematite occurs in large quantity; in fact, these deposits are the largest known in the West and their importance for the future depends solely upon problems of transportation. They are inaccessible from that part of the railroad as already built, but the completion of the route through to salt water will undoubtedly give an impetus to the building of the necessary short spurs to tap the district.

At Silver Reef, in Washington county, Utah,



SKETCH MAP, SAN PEDRO, LOS ANGELES & SALT LAKE RAILROAD.

TOWNS AND CAMPS.

1. Manvel.
2. Searchlight.
3. Eldorado Cañon.
4. Moapa.
5. Rioville.
6. Panaca.
7. Bullionville.
8. Pioche.
9. Modena.
10. Stateline.
11. Kalientes.
12. St. George.
13. Washington.
14. Silver Reef.
15. Kanab.
16. Pangvitch.
17. Parowan.
18. Beaver.
19. St. Thomas.
20. Overton.
21. Tonopah.
22. Resting Springs.
23. Sandy.
24. Good Springs.
25. Cottonwood Springs.
26. Los Vegas.

which is an old decadent camp, the Permian or Triassic sandstones have copper-silver ores disseminated through them, replacing organic remains and often deposited on fossils. These oxidized ores in the Silver Reef sandstones are related to similar occurrences in the Permian and Triassic sandstones of Texas and New Mexico. Silver Reef was discovered in 1877, and was once a prosperous camp. It has, however, long been practically abandoned. Although some predict a revival of mining in these old 'reef' deposits, it seems doubtful whether they will be rendered sufficiently accessible by the new railroad. Any railroad which is built to develop the iron deposits of Iron county will be a great benefit to Silver Reef; its future will depend on the low-grade ores; near-by, the upper Virgin and Green River valleys are thickly settled with Mormon villages.

The Dixie copper belt, already referred to, is mainly in Washington county, and follows the line of porphyritic intrusions between different limestones and dikes which often cut the formations in a way to resemble true fissures. These intrusions were probably concomitant with the orogenic block-tilting which resulted in the ranges of the region. Mineralogically, the field seems to be distinct from, and independent of, anything in the main Great Basin plateau. It appears rather to be related geologically to the copper district about Jerome, the same eruptives and red Devonian sandstones in the foot-hills being marked features of both regions.

The exposures of copper ore are found high up in the Beaver Dam and Mormon ranges, almost at the main axis of the mountains; they contain the black oxide (melachonite) and malachite, together with the blue carbonate (azurite), all intermixed with cuprite and hematite, making a remarkably self-fluxing ore. From these mines many fine specimens of malachite and azurite have been taken. Sufficient depth has not yet been obtained to develop the sulphide ores. The main shaft is now down nearly 900 ft. (on the ore zone); carbonates and oxides still predominate. If the Santa Clara, a tributary of the Virgin river, marks the limit of the rock-drainage of the mountains, as the absence of springs would seem to indicate, there should be a long life for the easily fluxed ores. The Santa Clara is 1,400 ft. vertically below the lowest stopes in the Apex mine.

If this attractive copper field is ever sought out for exploitation, transportation will have to be found by way of the Virgin and Muddy river valleys, intercepting the new Clark road near Moapa, or the southern extremity of the Meadow Valley wash. Nothing but deposits of high-grade ore, such as those of the Apex mine, could justify an attempt to operate any of these numerous prospects at such a distance from the base of supplies. It is economically impossible to construct a railroad from Modena to St. George. From Moapa, however, the distance would be about the same, and many valleys could be taken advantage of; and further extension through the Mormon settlements, up the Virgin to the Green river, would be quite feasible. It seems probable to the writer that the development of this region will not be brought about by anything yet discovered. The impetus will probably come first from the thickly settled valleys, seeking an outlet for their produce. However, prospectors are going every season into the St. George field, penetrating south and east into "No Man's Land," and the igneous ranges north of the Colorado river below the Grand cañon.

East of Modena, the Ely and Pioche districts are geologically well known. Pioche, at present tributary to Kalientes, may be said to be the last and southernmost camp the geology of which resembles the familiar Utah conditions of ore occurrence. Pioche was, as is well known, an old bonanza camp of the seventies, when it was made famous by the Raymond Ely and Meadow Valley mines. The camp is practically abandoned to-day, although there is some prospecting going on. All efforts to find the extension of the old bonanza contact have been in vain. In the Raymond Ely shaft-house

KALIENTES, PRESENT TERMINUS OF RAILROAD.

massive machinery, once hauled by wagon across Nevada, is going to ruin.

The best mines of Pioche were located along a strong fissure which cuts underlying Cambrian quartzite and a limestone capping. This fissure is occupied by a great porphyry dike and along the contact of this porphyry and the wall-rock the principal ore-shoots were found. Southwest of Pioche in the Pennsylvania mountains, and westward in the Pharnagat and Tem Piute districts, some attention has

RAYMOND-ELY MINE, PIOCHE, NEVADA.

been paid to silver-lead ores in limestone, and to veins with sulphide ores in quartzite and granite. Pharnagat and Tem Piute are too remote to be accessible even with the new road completed, but renewed prospecting in Pioche and in the Pennsylvania mountains, both of which will be easily reached from Kalientes, may afford some profitable ores.

De La Mar, an active camp to-day and tributary to Kalientes, is so well known that it need not be discussed here. These districts may be said to be the last of the Great Basin camps. Between the Escalante desert and the Colorado river, below the cañon, the Jura-Trias becomes economically important.

(To be Continued.)

LOSSES IN VANNING TIN ORES.

By Richard Pearce.

The following notes describe some experiments made with a view to determining approximately the accuracy of the ordinary process of vanning, as practiced in Cornwall and elsewhere, for assaying tin ores. Within my recollection, covering a period of 40 years, a great deal of discussion has taken place from time to time in the public press, and at numerous mine meetings in Cornwall, regarding the loss sustained in the dressing or concentration of tin ores, but no reliable data have ever been furnished to indicate the extent of this loss.

The chief difficulty encountered in investigations of this kind is the lack of a reliable method for determining, with any degree of accuracy, the percentages of tin oxide in crude ores of low grade, or of such a grade as is represented at the present time by the output of the Cornish mines. Take, for example, the output of the principal mine in Cornwall—Dolcoath, the average percentage of the ore, as indicated by the monthly sales, is below 2 per cent of oxide of tin, and the mineral cassiterite is so finely disseminated through the mass of hard quartzose material that it is even difficult to recognize it by the eye.

All the other commercial metals, such as gold, silver, copper, lead and zinc, can be determined with great commercial accuracy, and by expeditious methods, without difficulty, but the accurate assay of tin in such ores as are produced at Dolcoath and other Cornish mines would appear almost impossible. At any rate, the only method in general use throughout the district is the vanning process.

I am glad to be able to state that the matter is receiving the attention of the manager of Dolcoath, Mr. Arthur Thomas, who has employed a chemist at the mine with the express object of trying to investigate this important problem, so as to be able to furnish a correct measure of the actual loss sustained in the concentration of the crude ore.

It occurred to me, after much thought on the subject, that some reliable data as to the extent of these tin losses might perhaps be obtained by preparing (synthetically) a mixture of known ingredients, resembling in composition and general character such crude ores as are treated in Cornwall, and then experimenting upon it. For this purpose a gangue was selected, consisting mainly of quartz, chlorite, small quantities of pyrite and arsenopyrite, and containing, of course, no tin. A sample of cassiterite was selected from a Bolivian specimen, uniform in character and containing 70.38 per cent of metallic tin as determined by careful assay by the cyanide of potassium method. The mixture was carefully prepared, consisting of 150 parts, by weight, of the gangue, with 5 parts of the rich Bolivian tin ore, by pounding in a steel mortar, until the whole of the material passed through a 30-mesh screen. Great care was taken to prevent mechanical loss in the crushing, and preparation of the mixture, and the actual loss of material sustained did not exceed 0.4 per cent. After passing through the 30-mesh screen, this material was still further ground in a mortar to a pulp sufficiently fine for the ordinary determination of oxide of tin by vanning. The mixture prepared as above should contain 3.225 per cent tin oxide of 70.38 per cent metallic tin, or a total percentage of

metallic tin in the crude material equal to 2.269 per cent.

The entire sample was carefully mixed and divided into three portions. One portion was sent to the assayer at Dolcoath, with a request that he should determine in the usual way the percentage of tin oxide (black tin) it contained, and return the concentrates for inspection.

The second portion was assayed, by vanning in the same way, by myself, and as the results appeared to disagree, the third sample was sent to Mr. Reynolds, the instructor in vanning at the Camborne School of Mines, for determination by vanning.

The concentrated product (tin oxide) obtained from vanning by the two experts was returned for the purpose of comparison. The results are shown in the following table:

	Tin oxide, per c't.	Tin, per c't.	Metallic tin, per c't.	Tin recov'r'd, per c't.	Tin lost, per c't.
Dolcoath	2.970	at. 60.00	1.782	78.532	21.468
R. Pearce	2.530	at. 70.60	1.786	78.713	21.287
Reynolds	2.360	at. 75.09	1.772	78.096	21.904
Mean	2.620		1.78	78.447	21.553
Actual contents	3.225		2.269		

The concentrated product in each case was assayed for tin by Mr. E. V. Pearce, of Williams, Harvey & Co., tin smelters at Hayle, Cornwall, after digesting for some time in HCl for the purpose of dissolving out any iron oxide present. The percentage of tin contained in the three vanned products is shown in the second column.

The Dolcoath result exhibits a low degree of concentration, which is proved by the determination of the iron in the hydrochloric acid solution resulting from the preliminary chemical treatment of the concentrates samples; this solution gave 10.2 per cent Fe_2O_3, as compared with 6.46 per cent and 2.5 per cent found in the other samples by Pearce and Reynolds, respectively.

It will be seen from the above results that in the assay, by vanning, of an ore containing 3.225 per cent of tin oxide, a loss is sustained by the actual method in vogue of 21.55 per cent, and we may reasonably infer that an ore having a lower assay-value, such as is produced in Cornwall at this time, would suffer a correspondingly increased percentage loss in vanning.

It is more than probable that the mixture offered more favorable conditions for concentration, from the fact that the tin oxide was entirely free and contained no particles of gangue attached to it, such as would decrease the specific gravity considerably, thereby inducing an increased loss. I think we may reasonably infer, therefore, that the results obtained from vanning the mixture indicate a larger percentage of saving than can possibly be obtained by a similar treatment of the ore in its natural state as it comes from the mine.

GOLD MINING IN FRENCH GUIANA.—The British consular agent at Paramaribo reports that the gold placers of the Inini river, in the Maruni district, have been actively exploited during the current year, and the gold shipments indicate an increased output as compared with the previous year. Some important discoveries have been made recently along the upper Mana river, which is reached by small boats in a journey of 30 or 40 days.

THEORIES OF ORE DEPOSITION HISTORICALLY CONSIDERED.*

By S. F. Emmons.

Introductory.—The term "ore deposition," which is used in preference to its earlier synonym "vein formation" as more correctly representing the broader conceptions of the present day, applies, it is hardly necessary to state, only to the processes involved in the formation of deposits that form an integral part of the rock in which they occur, or "rock in place," as is the legal phraseology of the day, and does not include such recent detrital deposits as placers, etc., about whose origin there has never been any wide divergence of opinion.

The historic period is assumed to have been entered upon only with the revival of learning about the time of the Reformation at the commencement of the 16th century. What few records can be found of genetic opinions held before that time, even as to the more striking and readily observable geological phenomena, such as volcanic eruptions, earthquakes, and changes in the earth's surface, are too scattered and fragmentary to afford evidence of any continuous development of thought. The views of the Pythagorean and Aristotelian schools of philosophy on the causes of these natural phenomena, though apparently based more upon bold poetic fantasy than exact observation, present a clearer and more logical conception than that which obtained nearly twenty centuries later. Thus, it is said that as early as Origines, 600 B. C., the observed occurrence in the rocks of casts of shells and plants was ascribed to periodical floodings of the land. During the Middle Ages, however, under the monkish influence that discouraged any views that might throw doubt on the literal correctness of the Mosaic cosmogony, these fossils were variously assumed to have been formed in place by the agency of the stars, to have been transformed from rock by some plastic force (*vis plastica*), or left by the waters of the Noachian deluge.

Among the early cosmogonies, which, it is true, are of mythological rather than of scientific interest, the Chinese is the only one which included metal among the elements of creation. Yet the general use of the metals, whose extraction from their native ores presupposes a knowledge of the art of smelting—in itself an evidence of a certain insight into nature's processes—goes back to a very remote antiquity. It seems possible that the philosophers of these earlier civilizations may have indulged in speculations as to the origin of the metals, but, if so, they left no written record. Even among the Romans, of whose proficiency in mining evidence is found in most of the mining regions that came under their control, little or no genetic speculation was indulged in, if we accept the evidence of Pliny's 'Natural History.' This monumental work, which is assumed to contain a complete and faithful presentation of the knowledge of natural phenomena at the opening of the Christian era, though it described in considerable detail the methods of mining then in vogue, does not even attempt a description of the mode of occurrence of the ores, much less a speculation concerning their origin.

The historic time here contemplated may be divided in a general way into three periods, according to the prevailing method by which the views then current were arrived at:

1. The speculative period, in which, from a few rather imperfectly determined facts of nature, general theories were evolved intended to be applicable to all natural phenomena. It was a period in which geology was not yet recognized as a distinct science, and had hardly reached the dignity of an adjunct to mineralogy.

2. The second period was that in which facts or observation had accumulated sufficiently to establish geology on the basis of a distinct science, but in which the method of reasoning from generals to particulars still prevailed. This was the first scientific period.

3. The third period might be called the period of verification, in which the theories already propounded were tested by experiment and observation.

Such a classification is, in the nature of things, not susceptible of a very definite demarcation, either in point of time or in the assignment to either period of individual opinions or theories, but the attempt to make it, however imperfect and unsuccessful it may prove, will assist us in forming a clearer conception of the progress of thought and of the methods by which it has arrived at its present understanding of the particular branch of geological science which we are considering.

First period. During the first, or speculative period, which may be assumed to have extended up to the close of the 18th century, or to the time of Werner and Hutton, the accumulation of accurately determined facts that would bear upon the theory of ore-deposits was so extremely limited that it probably exercised but little influence upon the development of the science, beyond the suggestions it afforded to later students for lines of investigation to be followed, and hence may be passed over in a very cursory manner.

In the speculations of this period, which especially influenced the development of opinion, two general types may be distinguished.

First. The broader theories of the Cosmic philosophers with regard to the formation of the earth, based more or less upon astronomic data.

Second. Special theories of mineral vein formation, conceived by individuals and based in the main on general conceptions, which were supplemented by a certain amount of personal observation and experience.

The Cosmic philosophers were men who, without being geologists in the modern sense of the word, nevertheless put forth ideas with regard to the system of the earth that had an undoubted influence on the minds of those who have since made a special study of this part of science.

First of these was Descartes, the French mathematician and founder of the Cartesian system of philosophy ('Principia,' 1644), who considered the earth a planet like the sun, but which, though cooled and consolidated at its surface, still preserved in its interior a central fire that caused the return toward the surface of waters of infiltration, the filling of veins by the metals, and the dislocations of the solid crust.

Nearly contemporary with him was Steno, a Danish physician, who spent the greater part of his life in Italy, where he devoted much of his time to the study of geological phenomena. He was the first who sought to learn the origin of rocks and the changes in the earth's crust by the inductive method. He wrote a remarkable treatise bearing the quaint

*Presidential address before the Geological Society of America, at St. Louis, Dec. 30, 1903.

title *'De Solido intra Solidum Naturaliter Contento'* (1669), in which he considers vein-fissures to be later than the enclosing rocks, and their filling to result from the condensation of vapors proceeding from the interior. Steno's ideas, so much in advance of those of his age, seem to have found little favor among his contemporaries, and were scarcely known among geologists until called to their attention in the first half of the 19th century by de Beaumont and von Humboldt.

Later, Leibnitz, a German philosopher, inspired both by the ideas of Descartes and the observations and deductions of Steno, wrote a work on the origin of the earth ('Protogæa,' 1691), which, in spite of its necessarily limited basis of facts, bears the imprint of genius in its conceptions. In applying his theories to the veins of the Hartz, which he had occasion to visit during his thirty years' sojourn at Hanover, Leibnitz considers that they have been filled sometimes by the liquefying action of fire, sometimes by water.

In the following century, Buffon, the great French philosopher, excited to the highest degree the attention of the scientific world by his 'Théorie de la Terre' (1749) and 'Epoques de la Nature' (1778). His conceptions, though striking by the brilliancy of their imagination, have, for the most part, not proved of enduring value; nevertheless, they served a purpose by stimulating more exact observations on those points with regard to which his views were contested. With regard to mineral veins, he held that they were primarily fissures, opened in the mountains through the force of contraction, and that they were filled by metals which, by long and constant heat, had separated from other vitrifiable materials. But as there are non-vitrifiable, as well as vitrifiable materials in veins, there are secondary veins which have been filled with non-vitrifiable minerals by the action of water. The primary veins he considers to be characteristic of high mountains, while the secondary veins occur rather at the foot of the mountains, and probably derived some of their material from the primary veins.

In the second class, the foremost place, both in time and in the importance of his actual observations, must be accorded to Dr. George Bauer, better known by his latinized name of Agricola, a German physician, who flourished during the first half of the 16th century. He spent a great part of his life among the mines of Saxony (Joachimsthal), of which he made a careful study. He wrote, in most excellent Latin, several works on mineralogy and on the art of mining, which were for centuries standard books of reference on these subjects, and even to the present day contain much of interest to the mining engineer. Agricola was first and foremost a mineralogist, and all his work was characterized by acuteness of observation and accuracy of description, though, in strong contrast to most of the early writers, he did not indulge much in earth-formation theories. He divided mineral veins into *Commissurae* (joints or rents), *Fibrae* (small branching veins) *Venae* (large veins or channels), and *Terrae canales* (vein systems), and gives a clear account of their size, position, intersections, etc. In theoretical matters he was less definite and satisfactory.

During all this period the two main subjects of speculation with regard to mineral veins, which term practically included all ore deposits were (1) their age relative to the rocks in which they are found, and (2) the cause and manner of their filling; and, in considering the views put forward on this subject, we must bear in mind that chemistry as a science only came into existence toward the end of the 18th century; hence the ideas which were entertained as to the processes that may have been at work within the earth's crust to form metallic deposits were necessarily somewhat vague and fanciful.

Among the ideas on these points current in his time, Agricola, as a result of his observations, promptly rejected the view that veins were formed contemporaneously with the primary rocks of the globe, and that planets had an influence in the formation of the metals, but he seems to have had very few positive ideas of his own as to their origin, though inclining to ascribe vein filling to material brought in by circulating waters. He still entertained the idea of a lapidifying juice which he conceived as giving to water the power of absorbing earth and of corroding metals, and which might have formed fossil casts as well as minerals. His use of the term *fossilia* for both minerals and petrifications, which was retained by subsequent geological writers, especially those of the Wernerian school, is often a cause of misconception among modern readers, who have occasion to consult the older works on geology and mineralogy.

For over a century after Agricola there appears to have been little written that had any special bearing on ore-deposits, but toward the close of the 17th century there was an apparent awakening of interest in regard to their origin among reflective men who had to do directly or indirectly with mines, which may probably have been prompted by the theories of the Cosmic philosophers, so that by the close of the eighteenth century there had accumulated considerable speculative literature on this subject.

The views of most of these early writers were rather curious than instructive, yet some of them, especially those of men who had the largest practical experience in mines, are remarkably suggestive.

Rösler (1700), the earliest recorded mine superintendent, recognized that veins differ from ordinary cracks in the rocks only by being filled with metallic minerals, but did not speculate on their genesis. Becher and his commentator, Stahl, both professors of medicine, assumed in a general way that mineral veins were original cracks in the rocks containing matter that had been changed into vein-minerals by some exhalations from the interior. Henkel (1725) supposed further that certain kinds of rock or stone which served as matrices were favorable and even absolutely necessary to the formation of vein-minerals. Zimmermann (1745), who, like Henkel, was a chemist rather than a miner, considered that the material of veins, originally the same as the enclosing rock, had been altered by some saline solution and thus prepared for its final transformation into metallic minerals.

The above, which might be called conversion theories, do not necessarily assume that veins are mechanically formed cracks, and hence of more recent formation than the enclosing rocks.

Von Trebra (1785), a director of mines, who was seeking for facts to aid in their exploitation, thought the changes observed in mountains took place slowly under the influence of heat and humidity, and expressed his idea of conversion as applied to veins more distinctly as the taking away of one constituent of a rock and replacing it by another. The agent of the transformation he called putrefaction or fermentation, by which names he wished to designate some unknown force which produces the chemical changes in the rocks.

Lehmann (1753), a mineralogist, and also a director of mines, supposed that the veins found in mines are only the branches and twigs of an immense trunk that extends to a great depth in the bowels of the earth, where nature is carrying on the manufacture of the metals, and whence they travel toward the surface through rents in the rocks in the form of vapors and exhalations, as the sap rises and circulates through plants and trees. This general view is popular among practical miners, even up to the present day, probably because it appeals almost exclusively to the imagination.

Delius (1770), Gerhard (1781), and Lasius (1787) had the general idea that the veins were fissures formed later than the enclosing rocks, which had been filled by materials brought in by circulating waters. The last went so far as to suppose that these waters contained carbonic acid and other solvents, which enabled them to gather up metallic materials in their passage through the rocks. In this respect he approached closely to modern views, but he was in doubt whether the metals were contained in the rocks as such, or whether the solvents possessed the power of turning the substances they encountered in one place into lead, and, in another, into silver or some other metal.

Of more permanent value were the works of Von Oppell (1749), and Charpentier (1778), who were successively directors of the Saxon mines previous to Werner.

Von Oppell was the first to distinguish bedded deposits (*lagergänge*), or those which lie parallel with the stratification, from true veins. He also gave the small branches from a main vein the name of 'stringers' (*trümmer*), and noted that veins sometimes shift or fault the strata they cross, in which case he calls them 'shifters' (*wechsel*). He laid stress on the importance of the causes which have produced rents or fissures in the earth, and shows how in the formation of mountains, the rocks being exposed to great desiccation and violent shocks might split one from another, thus producing rents with some open spaces, which, being afterward filled, would form mineral veins. "Where a vein has been cut or deranged by a visible rent," he remarks, "it is again to be met with by following the direction of this last."

Charpentier was a careful observer and a very cautious theorizer. He says, "Natural history will always gain more from true and accurate descriptions of her phenomena than from many and yet too early explanations offered for them"—a most excellent principle, which he admirably carries out in his own work. He presents many arguments, derived from his own extensive observations in mines, against the prevalent theory that veins were once open cracks formed by contraction, and that they had been filled by material flowing in from the surrounding rocks and hardening in them. Some of his objections were:

(1) That contraction could not have made the kind of fissures that the veins are found to fill.

(2) Open or empty spaces could not have existed under the conditions present when

they were formed; pressure would have closed them.

(3) The fragments of country rock as found in veins could not thus be accounted for. If they had simply fallen into an open crack, they would have accumulated at its bottom and (4), the comparatively uniform arrangement of ore in the vein. The enrichment caused by the crossing of one vein by another; and the transition from vein-material to country rock, etc.. etc., could not be explained on the contraction theory.

Having given his reasons why he believes that veins are not the filling of wide-open spaces in the rocks, he says his readers will naturally ask how he supposes them to have been formed, and although he is not anxious to present a theory, he says he cannot see from his observation of the workings of nature, any other method, for the formation of veins or other ore-deposits, than by an actual transformation of the rock material. Nature's processes have created innumerable small cracks and fissures in the rocks and when a great number of such cracks lie together and in common direction they might give rise to a considerable vein deposit. Vapors bringing in mineral solutions might penetrate these small cracks, as the sap rises in capillary tubes in organic bodies. If thereby the intermediate rock mass became changed into vein-material, an ore-deposit might be created without the necessity of wide, empty spaces for its reception.

Rather more than usual space has been given here to Charpentier's work, because of the striking contrast in his mental attitude with that of his great successor, Werner, whose reputation so completely overshadowed him that he has received less notice from later writers than seems to be his due.

PETROLEUM PRODUCTION OF AUSTRIA.—The official returns of the petroleum industry in 1902, which have just been published, show that the output of the wells in Galicia was 520,847 metric tons, valued at $2,935,000. This is an increase of about 25 per cent over the production in 1901, which amounted to 404,624 tons.

THE INDICATOR, BALLARAT.

We are indebted to Mr. Wm. Bradford, of Ballarat, Victoria, for the accompanying photograph of the celebrated occurrence of gold ore, known throughout Australia as the 'Indicator.' It has been described elsewhere.[1] The present illustration is particularly good, as will be seen. The indicator is a thin seam of black slate of remarkable persistence, occurring in the Lower Silurian slates and sandstones of Ballarat. It is of great importance to mining exploration in that district, because the black thread of the 'Indicator' is found to enrich the quartz veins, which it intersects. In the illustration a miner is shown extracting specimen gold from a flat seam of quartz by the use of his pick. This scene was photographed at the 500-ft. level of the New Speedwell mine, in the eastern division of the Ballarat district.

THE 'INDICATOR,' BALLARAT.

NEW GEOLOGIC FOLIOS.—The United States Geological Survey has three new geologic folios ready for distribution. They are the Tishomingo (Indian Territory) folio, the Mitchell (South Dakota) folio, and the Alexandria folio, also of South Dakota. The Tishomingo quadrangle lies in the southeastern part of the Chickasaw Nation, the eastern edge being nearly three miles west of the Choctaw-Chickasaw boundary line, and the southern side about three miles north of the nearest approach of Red River. The mineral resources of the quadrangle are asphalt, granite, limestone and clay. Asphalt is the only product that has been developed to any considerable extent. The Mitchell and Alexandria quadrangles in South Dakota adjoin the Olivet and Parker quadrangles, which were also recently surveyed. The most important feature in these four folios is the discussion of the water resources of this region, and the most valuable result of the geologic investigations is the information obtained regarding distribution, variety, and accessibility of the water.

---

[1] "The Indicator Vein, Ballarat, Australia," by T. A. Rickard. *Transactions* American Institute of Mining Engineers. Volume XXX., pp. 1,004-1,019.

FATAL ACCIDENTS IN METAL MINING IN THE UNITED STATES.

By FREDERICK L. HOFFMAN.

(*Continued from page 80.*)

For the lead and zinc mines of *Missouri* we have more detailed information, and as far as possible the official data are given in full in the following tables. The general fatal-accident rate is available for the period 1889-1902, and the results are somewhat at variance with the observed experiences in other States.

Fatal Accidents in Lead and Zinc Mining, Missouri, 1889-1902.

Years.	Number employed.	Number killed.	Rate per 1,000.
1889.....	4,200*	12	2.80
1890.....	4,672	13	2.78
1891.....	5,065	12	2.37
1892.....	5,915	18	3.04
1893.....	5,113	17	3.32
1894.....	5,065	17	3.36
1895.....	6,214	23	3.70
1896.....	4,906	13	2.65
1897.....	5,374	16	2.98
1898.....	6,446	29	4.50
1899.....	9,619	27	2.81
1900.....	9,970	52	5.22
1901.....	10,000	41	4.10
1902.....	10,488	14	1.33
1889-95.....	36,244	112	3.09
1896-02.....	56,803	192	3.38
1889-02.....	93,047	304	3.27

*Estimated.

It is shown by this table that the mortality rate has varied from 5.22 per 1,000 during 1900 to 1.33 during 1902. It is hardly credible that there should have been so material a decrease in the fatal-accident liability during the last year for which we have the information, but the official reports do not indicate that the facts were not accurately returned. The average rate for the period was 3.27 per 1,000, having been 3.09 during the first seven years and 3.38 during the last seven years. In other words, there has been an increase of 0.29 per 1,000 since 1895. But for the low accident record of 1902 the increase would have been still greater. It is therefore of interest to consider in more detail the facts for the different counties, with special reference to the division of the mining territory into eastern and western fields. The table which follows shows the fatal-accident rate in lead and zinc mining by counties, and also by sections, together with the total number of persons employed during the period 1891-1902, and the total number of deaths occurring during the same period:

Fatal Accidents in Lead and Zinc Mining of Missouri by Counties.

County.	Field.	Total employees during 1891-02.	Total number killed by accident.	Rate per 1,000
Madison	Eastern.	3,283	3	0.9
St. Francois...	Eastern.	16,832	33	2.0
Jasper	Western.	46,871	191	4.1
Lawrence	Western.	6,928	36	5.2
Newton	Western.	6,124	8	1.3
Total eastern field.....		20,115	36	0.9
Total western field.....		59,923	235	3.9

The fatal accident rate for the eastern field was 1.8 per 1,000, against 3.9 for the western field. If the rates for the different counties are examined, it will be found that Lawrence county experienced the highest rate and Madison county the lowest; the rate in the former was 5.2 per 1,000, and the rate in the latter 0.9. If we subject the returns to a still further analysis, we are able to make a comparison between the first five years of the period and the last five. This has been done in the following table, which shows, first, the total number killed by accident; second, the rate per 1,000 of persons employed:

Fatal Accidents in Lead and Zinc Mining of Missouri by Counties.

County.	Number killed by Accident. 1891-96.	1897-02.	Rate per 1,000. 1891-96.	1897-02.
Madison	1	2	0.6	1.3
St. Francois	16	17	3.1	1.4
Jasper	63	128	3.6	4.4
Lawrence	12	24	3.2	7.7
Newton	2	6	0.8	1.7
Total Eastern Field	17	19	2.5	1.4
Total Western Field	77	158	3.2	4.4

In the eastern mining counties the rate decreased from 2.5 per 1,000 during 1891-96 to 1.4 during 1897-02. In the western counties, however, there was an increase from 3.2 to 4.4 per 1,000. In other words, the increase in the fatal-accident liability in the lead and zinc mines of Missouri occurred in the western territory. If we examine the rates for the different counties we find that the rate for Madison county increased quite considerably, but the number of miners at work in this county is rather too small for final conclusions. In St. Francois county, also, the rate decreased considerably. In all the western counties the rate increased, but especially in Lawrence county, where it increased from 3.2 to 7.7 per 1,000. In Jasper county the rate increased from 3.6 to 4.4 per 1,000; in Madison county from 0.6 to 1.3 per 1,000, and in Newton from 0.8 to 1.7 per 1,000. In other words, the increase in the number of deaths from accident has been quite general in the western division of the mining territory of Missouri, while the eastern division shows a material decrease.

If we inquire into the causes of accidents, we are able to summarize the returns in the following table for twelve years, 1891-1902:

Causes of Fatal Accidents in the Lead and Zinc Mines of Missouri, 1891-1902.

Cause.	Number killed.	Per cent.	Rate per 1,000 employed.
Falls of roof	71	25.8	0.84
Falls down shaft	60	21.8	0.71
Explosions	56	20.3	0.67
Falls of rock	27	9.8	0.32
Falls of articles down shaft.	19	6.9	0.23
Machinery	17	6.2	0.20
Asphyxiation	13	4.7	0.15
Cars	4	1.5	0.05
Other causes	8	3.0	0.10
Total	275	100.0	3.27

Of the total number of fatal accidents, 25.8 per cent were due to falls of roof, 21.8 to falls down shaft, 20.3 to explosions, and 9.8 to falls of rock. How far these percentages compare with the experience in metal mining operations in other States cannot at present be stated, since the corresponding data are not readily available. It, however, is possible to give some additional data regarding the fatal accidents affecting different groups of employees, and a convenient summary return is made in the following table showing the causes of accidents, first, for superintendents, foremen and bosses; second, for miners; and third, for other employees.

Fatal Accidents in Lead and Zinc Mining of Missouri by Occupation and Cause, 1891-1902.

	Superintendent. foremen & bosses. Number killed.	Per cent.	Miners. Number killed.	Per cent.	Other employees. Number killed.	Per cent.
Falls of roof	7	26.9	61	28.7	3	8.3
Falls down shaft	6	23.1	42	19.7	12	33.3
Explosions	6	23.1	46	21.6	4	11.1
Falls of rock	2	7.7	23	10.8	2	5.6
Falls of articles down shaft	3	11.6	13	6.1	3	8.3
Machinery	1	3.8	9	4.2	7	19.4
Asphyxiation	1	3.8	11	5.2	1	2.8
Cars	.	..	2	0.9	2	5.6
Miscellaneous accidents	.	..	6	2.8	2	5.6
Total	26	100.0	213	100.0	36	100.0

It is unfortunate that we do not have the total number of men at work in the different groups of employments, but this information is not given in the official reports. It is shown by this comparison that while among the first group of employees 26.9 per cent of the fatal accidents were due to falls of roof, and of the second group of employees, that is, miners in particular, 28.7 per cent, the percentage for the remainder of the employees was 8.3. It is not necessary to enter into a further discussion of the details of this comparison, which is readily understood by the tabular statement.

The general facts established by this investigation, covering the period 1898-1902, are summarized as follows:

The fatal-accident rate in metal mining has been highest in Montana, or 3.57 per 1,000 employed, and lowest in the copper mines of Houghton county, Mich., or 2.50 per 1,000 employed. If we compare the mortality of metal miners with the mortality of coal miners in Pennsylvania we have the following result for the period 1898-1902:

Comparative Mortality from Accidents in Metal and Coal Mines, 1898-1902.

	Total number employed.	Total number killed.	Rate per 1,000
Montana (all mines, but mostly metalliferous)	63,270	226	3.57
Missouri lead and zinc mines	46,523	163	3.50
Pennsylvania anthracite mines	722,621	2,096	2.90
Colorado metalliferous mines	181,930	521	2.86
Pennsylvania bituminous mines	541,248	1,479	2.73
Michigan copper mines (Houghton county)	65,119	163	2.50

The mortality is shown to have been excessive in Montana, Missouri and Colorado, but quite favorable in Houghton county, Michigan, assuming, of course, equal accuracy in the official reports for the different States. It, however, must be understood that the fatal-accident rate of 2.5 per 1,000 is a sufficiently serious factor to increase materially the general mortality of the persons employed. If we extend this comparison to the causes of accidents the results are summarized as follows:

Falls of Rock, Including Cave-ins.—Of the fatal accidents due to all causes, the percentage of accidents due to falls of rock, including cave-ins, was 35.6 for the lead and zinc mines of Missouri, 31.3 for the copper mines of Michigan, 28.7 for the mines of Montana, and 22.8 for the metal mines of Colorado. The mortality due to falls of roof and rock, etc., per 1,000 employed, was 1.23 for Montana, 1.16 for Missouri, 1.12 for Michigan and 0.70 for Colorado. In other words, relatively to the total mortality from accidents, deaths due to falls of roof and rock, etc., were most frequent in Missouri; but, in proportion to the number employed, the rate for this group of accidents was highest in Montana.

Falls Down Shaft.—Accidents due to this group of causes formed 24.2 per cent of the total mortality in Colorado, 24.0 per cent in Montana, 21.8 per cent in Missouri, and 14.0 per cent in Michigan. In proportion to the number employed, the mortality rates due to falls down shaft were 1.03 for Montana, 0.74 for Colorado, 0.71 for Missouri and 0.50 for the copper mines of Michigan.

Explosions.—Of the mortality from all accidents, explosions caused 26.4 per cent in Colorado, 20.3 per cent in Missouri, 19.6 per cent in Montana and 12.7 per cent in the copper mines of Michigan. In proportion to the number employed the death rate due to explosions was 0.84 per 1,000 for Montana, 0.81 for Colorado, 0.67 for Missouri and 0.45 for Michigan.

Asphyxiations.—The percentage of deaths due to asphyxiation in the mortality from all accidents was 22.7 for the copper mines of Michigan, 8.5 for Colorado, 6.5 for Montana and 4.7 for Missouri. In proportion to the number employed, the mortality due to asphyxiation was 0.81 per 1,000 for Michigan, 0.28 for Montana, 0.26 for Colorado and 0.15 for Missouri.

Other Shaft Accidents, Including Cage and Car Accidents.—The percentage of deaths due to this group of causes in the mortality from all accidents was 11.84 for Montana, 11.53 for Colorado, 10.67 for the copper mines of Michigan, and 8.4 for Missouri. In proportion to the number employed, the mortality for miscellaneous shaft accidents was 0.51 per 1,000 for Montana, 0.38 for the copper mines of Michigan, 0.35 for Colorado and 0.28 for Missouri.

Other accidents, such as drowning, scalds, machinery, etc., do not permit of ready comparison for the different States.

This brief analysis of the available information regarding fatal accidents in the metal mines of the United States proves conclusively the importance of a more comprehensive investigation, and the necessity of more detailed official reports on the subject. On the basis of a conservative estimate, there occur annually not less than 600 accidental deaths in connection with metal mining in this country, and this loss of life is certainly sufficient to warrant a more serious consideration of the subject than it has thus far received.

THE SOMERVILLE MINES OF THE BEECH CREEK COAL & COKE COMPANY.

A considerable tonnage of bituminous coal is shipped over the branches of the New York Central lines west of Williamsport, Pa., from mines in Clearfield, Indiana, Jefferson and Cambria counties in Pennsylvania, these branches forming what is known as the Beech Creek system. The total tonnage shipped in 1903 approached 7,000,000 tons. Of the companies having mines in the counties mentioned and shipping over the Beech Creek system, one of the largest is the Beech Creek Coal & Coke Company. It has some 25,000 acres of land in three well-selected locations, near Winburne, Patton and Arcadia. The mines at Winburne are here described because their equipment has some interesting features, and, while not as costly as that installed at certain other mines in the region, it is remarkably efficient, this efficiency being largely due to the good judgment shown by the management.

At Winburne and the neighboring village of Munsons, the Beech Creek Company has five mines, which in 1902, according to the mine inspector's report, produced 406,757 tons. The output in 1903 was undoubtedly larger. At Winburne are the Somerville No. 8 and No. 9 mines, and at Munsons the Forest No. 1 and No. 2. Electricity is used largely for haulage. The central power plant at Winburne contains two Ridgway, 200-kw. direct-current generators, direct connected to two 315-h. p. McEwen engines, the engines and dynamos being made by the Ridgway Dynamo & Engine Company, of Ridgway, Pa. The steam for the engines is first passed through separators, and the exhaust steam goes to a Patterson water-tube Berryman heater, which heats the feed water for the boilers. There are two 175-h. p. and two 125-h. p. tubular boilers, made by the Union Iron Works, of Erie, Pa.

The generators have a continuous field to prevent sparking, and are over-compounded, the normal voltage being 275, which rises to 325, as a maximum when the locomotives strike up-grades at the same time. In the power-house is a Westinghouse four-panel switch-board, two panels being for the generator circuits and two for the feeder circuits.

GENERAL VIEW AT SOMERVILLE NO. 9 MINE.

The current breakers are of large capacity with triple contacts. The switch board also has a ground detector. From this power-house the current is carried to the mines. The longest distance is 3.5 miles. On this circuit the current is carried by 1,000,000 cm. cables, a distance of 8,500 ft., thence by 0000 Fig. 8 trolley wire, 1.5 miles more. For the electric locomotives on the surface and underground, power is supplied by 0000 Fig. 8 trolley wire. The various forms of insulators used are made by the Ohio Brass Works. Either wooden posts and caps or wooden posts and iron pipe are used to support the wire on the surface. Near the power-house is a repair shop, where the company has equipment for repairing cars, turning car-wheels, winding armatures, etc.; also a brass foundry for casting trolley wheels, journal boxes, etc., from scrap brass.

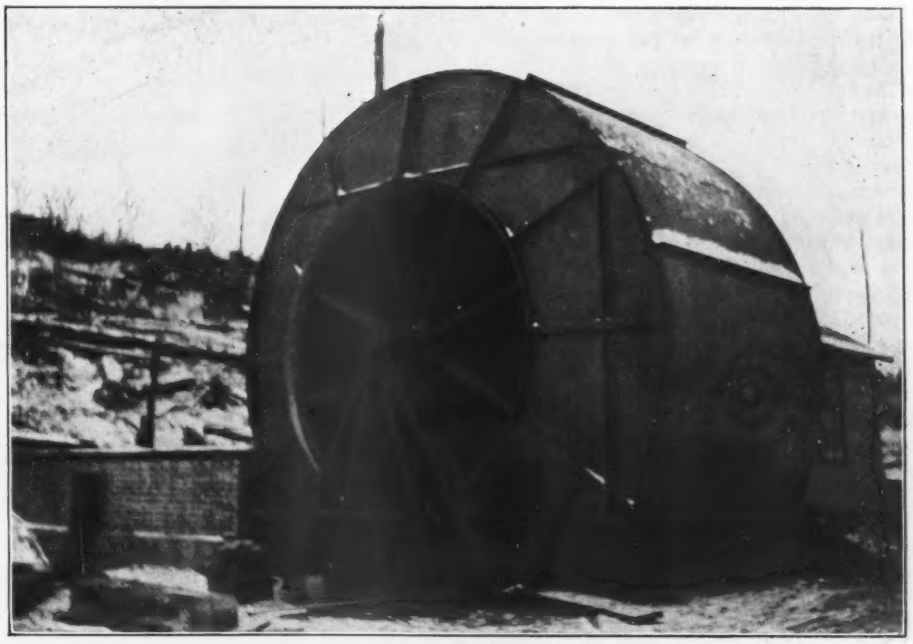
From the central power-plant the electric locomotives at three mines take current. There are three, all of Morgan-Gardener make, weighing 8 tons, and rated at 75 h. p. They not only haul the trips to and from the tipple, but in one or two mines make up trips. The cars used hold one ton of coal. The loads hauled depend on the mine grades.

Like most of the mines in the Clearfield region the openings at Munson and Winburne are drifts; consequently, drainage is not a serious problem, and large pumps are not needed. To drain the hollows, caused by rolls in the floor, centrifugal pumps are used, driven by 2-h. p. electric motors, the highest lift being 20 ft. The vein worked is the B, or lower Kitanning of the Pennsylvania Survey.

The seam is about 3.5 ft. thick. On the roof is about 14 in. of bone and impure coal, and over the gangways this is taken down with about 1 ft. of slate, making the gangways 5½ ft. high. In general the mines are worked by the gangway and airway system, though at one mine the three-entry system is used, the middle gangway being for haulage. All the haulage-ways are laid with 30-lb. rails, and with frogs made by the Pennsylvania Steel Company; home-made frogs, though they are used by some companies, being a fruitful source of trouble with electrical equipment. From the main gangways cross-headings are turned, and from these chambers are driven. The chambers are 27 ft. wide and 250 ft. long. Pillars are 12 to 24 ft. wide, according to the condition of roof, depth of workings below surface, etc.

One of the mines at Winburne was opened several years ago, and is now worked back over a mile from the entrance. Ventilation is by fans. At Somerville No. 8 mine is a 4 by 10-ft. Capell fan belted to a 40-h. p. Atlas engine. This fan moves about 75,000 ft. of air per minute at 1.25-in. water gauge. At Somerville No. 9 is a Robinson 16-ft. double-inlet fan, made by the Robinson Machine Company, of Allegheny, Pa., driven by a 100-h. p. General Electric motor. The guaranteed capacity of this fan is 200,000 ft. of air per minute, against a 7-in. water gauge. It is now moving over 100,000 ft. per minute, against 1.5 to 2-in. water gauge at 70 revolutions per minute. The main shaft of this large fan is 9 in. in diameter at the bearings. The motor is geared to the fan by a rawhide pinion on the motor shaft. As the cut shows, the fan requires no housing. The fan drift is of most substantial construction, having brick walls and a concrete roof supported by T-beams. It is about 12 ft. wide and 7 ft. high. The inside airways have an area of about 50 sq. ft. The mines are not gassy and open lights are used throughout the workings.

The tipple at No. 9 Somerville is provided with an automatic scale that greatly facilitates the work of the weighman, and a Phillips cross-over dump. The ultimate capacity of Somerville No. 9 mine is intended to be 1,200 tons daily. The coal is not screened, but is shipped as run-of-mine. A considerable tonnage from the openings named is used by locomotives on the New York Central. Mr. John L. Somerville is the mine superintendent at Winburne for the Beech Creek Company.



ROBINSON FAN AT SOMERVILLE NO. 9 MINE.

AN ENORMOUS IRON-ORE DEPOSIT.—According to an article in a German contemporary (*Stahl und Eisen*, December 1, 1903), a survey of the Luossovara iron-ore deposits made under the direction of the Swedish government shows that they contain 235,000,000 tons of ore in the portion lying above sea-level, while drilling-tests indicate that 400,000,000 tons are present within the depth of 100 m. below sea-level. The shipments from the mine in 1902 were 232,000 tons, but they will be increased to 1,200,000 tons annually with the completion of the Ofotin railroad and the harbor improvements at Narvik.

THE DELPRAT OR SALT-CAKE PROCESS FOR MIXED SULPHIDES.

By Donald Clark.

In 1901 C. V. Potter took out a patent for the recovery of sulphides from their ores based on the application of an entirely new principle. Mr. Potter discovered that very dilute acidulated solutions, when added to finely pulverized ores, caused certain sulphides to rise to the surface. For economic reasons, mainly, dilute sulphuric acid was recommended of a strength of from 1 to 10 per cent. What the action was which caused the flotation of the sulphides is not stated in the specification, but from experiments made it appears to be due mainly to two causes. In the case of a mineral such as sphalerite or sulphide of zinc there is invariably a trace, at least, of isomorphous sulphide of iron (FeS). Dilute sulphuric acid will not appreciably attack the zinc sulphide, but the sulphide of iron is superficially attacked and a bubble of sulphuretted hydrogen forms.

$$FeS + H_2SO_4 = FeSO_4 + H_2S.$$

The H_2S bubble clings to the sulphide particle, and when large enough will carry it to the surface. The specific gravity of blende is 4, or 4 grams will displace a cubic centimeter of water, so that, neglecting the weight of the gas, a bubble of 3 cc. of H_2S will be sufficient to float the 4 grams; and since 98 grams of sulphuric acid will produce 22.3 liters of H_2S at 0° C. and 760 m.m. pressure, this amount of gas should support 29,760 grams of blende, or, practically speaking, 300 times the weight of the sulphuric acid decomposed should be lifted. By heating the solution to near its boiling-point a lesser amount of acid is needed on account of the expansion of the bubbles, every 3 c.c. expanding to nearly 4 c.c. In the foregoing it was assumed that 4 grams could be raised. It is found in practice that only the finest particles, such as slimed products, can be lifted by the tiny bubbles attached.

In the second case, when two or more minerals are present they appear to form a couple, and the bubbles transfer themselves to the electro-negative ingredients, somewhat after the manner of a zinc-copper couple when polarization is caused by the hydrogen clinging to the surface of the copper. For instance, with calcite and sulphur in dilute sulphuric acid the bubbles will leave the calcite and attach themselves to the sulphur.

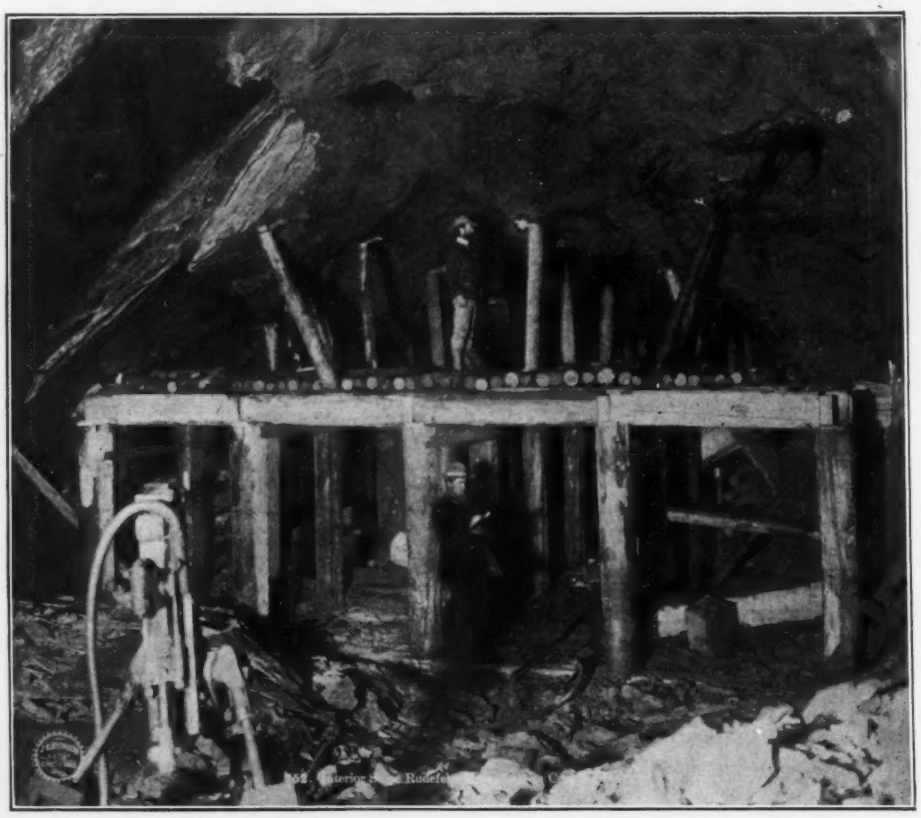
Whatever the ultimate explanation may be, the action is almost instantaneous in separating zinc sulphide from Broken Hill ores. Some millions of tons of tailings have accumulated at the Hill which have high zinc values, but it was not possible to remove the gangue, which consisted of garnet (sp. gr. 4) and rhodonite (sp. gr. 3.5) by dressing.

In 1902 G. D. Delprat, general manager of the Broken Hill Proprietary Company, patented a process which has been called the salt-cake process. Salt-cake, or crude sulphate of soda, is dissolved in water until the specific gravity of the solution is approximately 1.4; sulphuric acid is then added, as in Potter's process, and the reactions go on in the same way, after applying heat. It is claimed that by densifying the solution a more speedy action occurs with lesser decomposition of acid. In this case the volume occupied by the bubble for 4 grams at the moment of flotation will be $4 \div 1.4 - 1 = 1.84$ c.c. This means a correspondingly lesser consumption of acid. An additional saving is said to be effected through fewer waste-bubbles escaping. In neither case, of course, is the action perfect, but in both, the sulphides rise in black, coherent mass, very little gas escaping. Up to 90 per cent of the zinc is removed in a few minutes. Experimental lots were treated at Broken Hill so successfully that a plant capable of dealing with 1,000 tons per week has now been erected. Another process has been patented by Mr. Delprat, in which a cold nitric acid solution is brought into contact with sulphides. This solution is densified with nitrate of sodium, zinc or potassium. The action in this case is mainly due to the gases given off from the decomposition of the nitric acid, such as nitric oxide and nitric peroxide, attaching themselves to the particles of sulphides and floating them to the surface. Decomposition of nitric acid is excessive, and it is hardly likely that this process will ever be a commercial one, although the sulphides rise readily enough.

Another process, known as Odling's, has recently been patented; in this chlorine water is used, and powdered ores containing zinc sulphides are sifted in. The zinc sulphide instantly floats, while the gangue falls to the bottom; it is claimed that this process may be commercially applied.

The plant necessary for working these processes cannot yet be said to have been evolved, and there is scope for much ingenuity among your readers to devise an improvement on the existing ones. Provision must be made for the ready escape of the bubble and its burden from the mass of slime in which it is entangled, or the bubble will leave the particle behind; secondly, the sulphides should be removed the instant they rise to the surface, otherwise the bubble becomes detached and they fall again. Since only certain sulphides appear to be removed by this method in reasonable time, it is necessary to advise those who desire to carry on experiments to procure samples of slimes from the Broken Hill Proprietary or its neighbor, the Block 10 mine.

The application for the nitric acid patent is opposed by Mr. Potter, who claims to be the discoverer of the principle that acids without any other admixture will cause sulphides to float; litigation is also pending over the salt-cake process.



UNDERGROUND IN THE RUDEFEHA MINE, WYOMING.

COPPER PRODUCTION IN WYOMING.

The records of the State Geologist's office of Wyoming show that in 1882 there was produced in the territory—as it was then—75,000 lb. of copper, and in 1883 there was 962,468 lb. For the years from 1884 to 1887, inclusive, there is no record of production. In 1888 there was 232,819 lb. reported, and in 1889 there was 100,000 lb. From 1890 to 1894, inclusive, there is no record. In 1895 the output reported was 6,782 lb.; but in 1896 there was again no record. For the years from 1897 to date, the quantity reported is shown in the following table, in pounds:

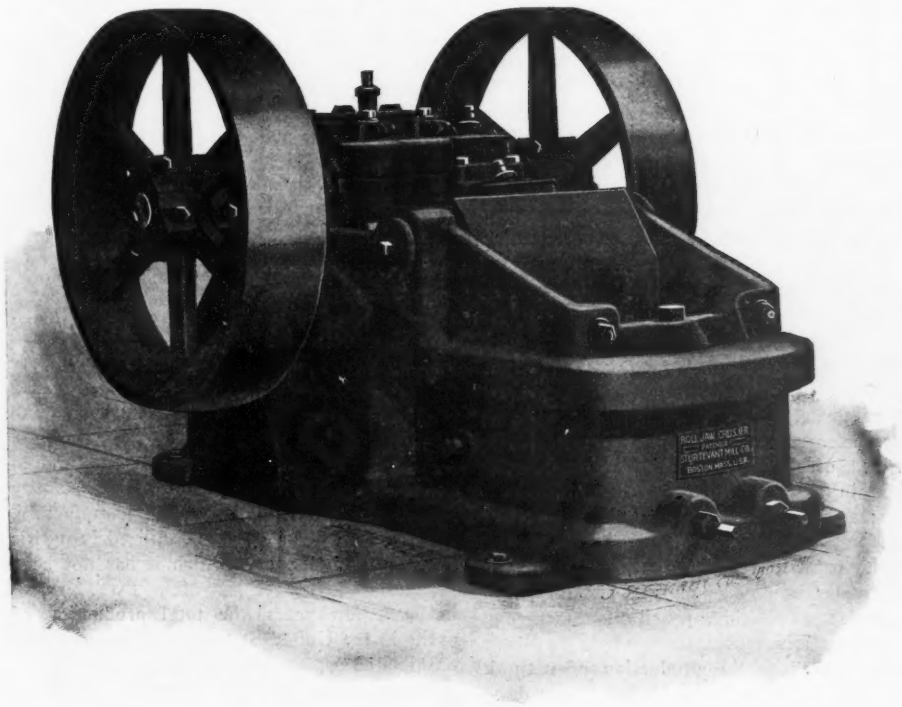
1897	127,471	1901	914,412
1898	233,044	1902	75,297
1899	3,104,827	1903	947,106
1900	4,206,776		

The total production shown by this record is 10,986,092 lb., and the total value, taking the average for each year reported, was $1,726,729. The present laws of Wyoming, however, do not provide that all metal production shall be reported to the State.

PLATINUM PRODUCTION OF RUSSIA.—The production of platinum in 1903 is reported by the Russian Department of Mines to have been 389 *poods* 3 *funts*, which is equivalent to 204,892 troy oz., as compared with 446 *poods*, or 234,878 troy oz., in 1902.

ROLL-JAW CRUSHERS.

The accompanying illustration shows two designs of roll-jaw crushers intended for the fine crushing of ore and other materials. Both are made by the Sturtevant Mill Company, of



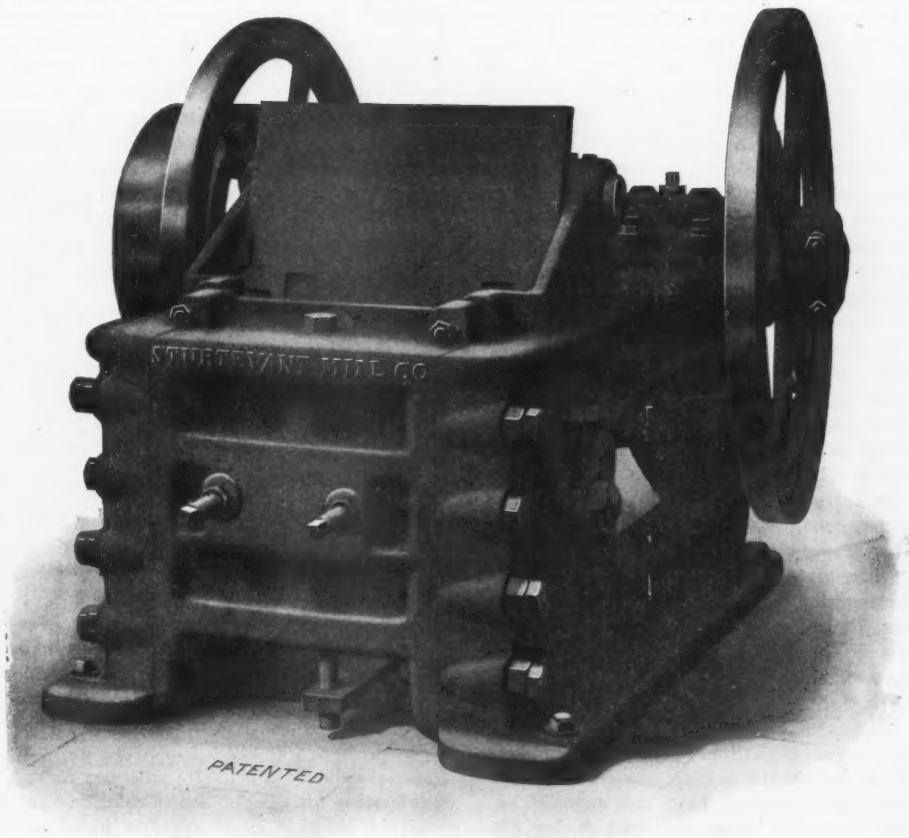
ROLL-JAW CRUSHER, CAST IRON CONSTRUCTION.

Boston, Mass. These crushers are machines of rather simple design. They are jaw and toggle machines of the Blake type, but so made that the jaws, instead of advancing and receding, as in ordinary rock-breakers, always remain the same distance apart, and thus deliver a fine and uniform product. The object of the peculiar grinding motion given to the jaws is to do the work ordinarily performed by a breaker and rolls. The arrangement of the parts admits of a class of work which can hardly be done by any other single breaker with hard rock. They have the further advantage that they do not clog, the grinding movement setting the material constantly free. The design is intended to give a large output at the lowest possible cost, where a fine product is required.

The first illustration shows a roll-jaw crusher, with cast-iron frame, the reciprocating parts being of steel. This is a compact and simple design, and makes a heavy and strong machine, occupying a comparatively small space. The second illustration shows a machine of the same type, but with the outer frame made entirely of steel and in sections. While it is lighter than the cast-iron frame, the strength is greater, owing to the material used in its construction.

SWEDISH IRON ORE SHIPMENTS.—The shipments of iron ore over the Ofoten Railroad, in Sweden, during the past year, which is the first that it has been in service, amounted to 857,867 metric tons.

ARGON.—At a recent meeting of the Paris Academy of Sciences a new method of preparing argon was described by MM. H. Moissan and A. Rigaut. The argon is prepared in four stages, the first three of which, the removal of oxygen from the air by heated copper, concentration by passing over a mixture of lime and magnesium twice, are identical with the processes worked out by Sir W. Ramsay and Lord Rayleigh. In the fourth stage the gas, after passing over a lime-magnesium mixture, is treated with pure metallic calcium at a dull red heat. Since calcium forms a hydride stable at 500° C., this removes at one operation the last traces of nitrogen and hydrogen. The apparatus produces one liter of pure argon in 12 hours.



ROLL-JAW CRUSHER, SECTIONAL STEEL CONSTRUCTION.

THE PRODUCTION OF THE MINOR MINERALS IN 1903.

By JOSEPH STRUTHERS.

BAUXITE.

There has been a very large increase in the production of bauxite in the United States during 1903, due chiefly to the development of the industry in Arkansas. The total output shipped was 40,700 long tons, valued at $179,080, as compared with 27,322 long tons, valued at $121,465 in 1902, showing for the year just closed an increase in quantity of 13,378 long tons (approximately 50 per cent) and in value of $57,615 (approximately 50 per cent) above the returns for 1902.

The output during 1903 is composed of 22,700 long tons from Georgia and Alabama, and 18,000 long tons from Arkansas. The statistics for the former States have been compiled with great care and represent very closely the actual returns; but for the production in Arkansas more latitude must be allowed, owing to the conservatism of one of the large producing concerns which declined to contribute its quota of information to the general fund, although the statistics so supplied are used solely for the compilation of aggregates in which the identity of an individual report becomes absolutely absorbed. The estimate for this State, however, is fairly close to the actual quantity of bauxite shipped during the year.

The mining plant of the Pittsburg Reduction Company at Bauxite, Ark., was completed early in 1903, and by its efficiency the output of bauxite from this company's mines has been very largely increased. The plant is constructed on thoroughly modern principles, and designed to replace hand-labor by machinery wherever possible. Mechanical conveyors and elevators carry the crude ore from the cars to and through the mills, finally storing the re-

fined product in bins ready for shipment. The furnace equipment includes a wood-fired cylindrical dryer and two 60-ft. rotary calciners fired by producer-gas made in a 10 by 12-ft. water-sealed Duffs producer. The crude ore is ground in a series of coarse and fine crushers. A large proportion of the ground product is calcined direct, the smaller quantity being first washed to remove the silicious gangue and dried before it is charged into the calciners. Other buildings at the plant include a machine-shop, saw-mill, planing-mill, 30 dwelling-houses for the employees, an electric-light station, and an ice-plant with attached cold-storage rooms. The new refining plant of the Pittsburg Reduction Company, occupying six acres of ground, three miles from East St. Louis, Ill., was completed during the summer, and refining operations were commenced shortly afterward. The equipment is similar to the plant at New Kensington, Pa., and the removal of the impurities from the ore (iron oxide and silica) is accomplished by the old soda process. An interesting feature of the works is the recent addition of coke-ovens for coking Illinois coal. These ovens work very satisfactorily, and supply the fuel required for the lime-kilns of the company.

Until the completion of the East St. Louis plant, the crude and calcined ore has been shipped from the mines in Arkansas to the refining plant at New Kensington, Pa., for the extraction and purification of aluminum oxide, which was then sent to the Niagara Falls works of the company for manufacture into aluminum ingots and plates. The final working of the metal into sheets and bars is done at New Kensington.

The supply of bauxite in the United States is consumed chiefly for the manufacture of aluminum, although a considerable quantity supplies the crude material from which alum and aluminum sulphate are made. For this latter purpose the ore must be quite free from iron. The Arkansas product and that imported from France, containing too much iron to be available for the manufacture of alums, is utilized to make aluminum hydrate for reduction in the electric furnace to metallic aluminum. Practically the entire quantity of bauxite imported into the United States was obtained from the mines in southern France, the cheap ocean freight rate to eastern seaports (from $2.25 to $2.50 per ton), combined with the low duty of but $1 per ton, permitting the ore to be delivered at a cost not exceeding $3.25 per ton ex mine. The average rate of freight from Georgia or Alabama to Philadelphia has been nearly $4 per ton, while to Boston it has even exceeded $5 per ton, conditions which permit the delivery of French ore at our seaport cities at a cost less than that of the domestic product. The quality of the French bauxite, however, is of lower grade than the ores from Georgia and Alabama on account of the large percentage of iron oxide present.

GRAPHITE.

There was a small increase in the production of natural crystalline graphite in the United States during 1903, the quantity reported as having been marketed during the year amounting to 4,177,020 lb., valued at $154,549, as compared with 4,176,824 lb., valued at $153,147, in 1902. Nearly the entire output was obtained from the mines in the Ticonderoga district, New York, although the mines near Chester Springs, Pa., contributed a small proportion of the total output. The above statistics for 1903 do not include the output of companies operating mines at Stockton, Ala., nor near Dillon, Mont., and in Remington county, South Dakota. These States contributed, in the aggregate, a considerable quantity during 1902, but no returns were vouchsafed for 1903. The failure to receive reports for the latter year, however, does not signify that no production was made.

The demand for natural crystalline graphite in the United States continues to be supplied largely from foreign countries (mainly Ceylon), the quantity imported during the 11 months ending November 30, 1903, amounting to 33,828,480 lb., valued at $1,170,534, which is equivalent to 36,903,940 lb., valued at $1,296,944, for the entire year, as compared with 40,857,600 lb., valued at $1,168,554, in 1902. These figures show that the crystalline graphite mines in the United States supply only a small percentage of the total consumption of the country. In connection with the demand for graphite in the United States, 55 per cent of the total annual supply is consumed in the manufacture of graphite crucibles; 15 per cent for stove polish; 10 per cent for foundry facings; 10 per cent for graphite paint and 5 per cent for other purposes, including powder-glazing, electrotyping-powder, steam-packing, pencil manufacturing and various minor uses.

With regard to the production of natural amorphous graphite in the United States during 1903, it has not been practicable to collect satisfactory statistics, chiefly for the reason that it has never been clearly defined what mineral products should be included in this class. In former years, graphitic anthracite from Rhode Island and the so-called "Baraga graphite" have been reported as amorphous graphite, although the latter is in reality a carbonaceous schist and the former approximates a semi-anthracite. Furthermore, in recent years a concern in Georgia has produced several thousand tons annually of a carbonaceous earth which has been utilized solely as a filler for fertilizers; this material, also, has been reported by some statisticians as amorphous graphite, although neither its physical composition nor its use in the trade has justified this classification.

Artificial graphite, both of the crystalline and amorphous variety, continues to be manufactured by the sole producer in the United States, the International Acheson Graphite Company, with works at Niagara Falls, N. Y. This concern reports an output during 1903 of 1,938,000 lb., valued at $160,479, as compared with 2,358,828 lb., valued at $110,700, in 1902, showing a decrease in quantity amounting to 420,828 lb. The quantity of artificial graphite reported includes graphitized electrodes and the so-called "artificial graphite;" in the former case the ordinary electrode, composed of a mixture of petroleum coke, pitch, and a carbide-forming material (iron oxide or silica), is submitted to the intense heat of an electric-arc furnace, and the whole graphitized, yielding a product possessing qualities of special value in electrolytic processes for the manufacture of caustic soda, chlorine, and metals in chloride solutions; also in certain metallurgical processes and in the construction of electric furnaces. For the production of artificial graphite, anthracite coal is heated in an electric furnace and the impurities eliminated mainly by volatilization, the ash being reduced, in some cases, to as low as 0.5 per cent. The product is in the form of grains and powder, and is used chiefly for the manufacture of graphite paints, dry batteries, commutator brushes; also, to a small extent, in the manufacture of lubricants, in electrotyping work, and in certain chemical processes which require a carbon of special purity.

Despite the development of the artificial graphite industry, the demand for the natural product continues to increase, especially for the 'flake' variety of the crystalline mineral, due to the increased demand for graphite crucibles for making steel, brass and other alloys, for commutator brushes, etc., in electrical machinery, as well as for special lubricants to be used at comparatively high temperatures.

PYRITE.

The production of pyrite in the United States during 1903 used for the manufacture of sulphuric acid amounted to 196,970 long tons, valued at $778,031, as compared with 228,198 long tons, valued at $971,796, in 1902, a decrease in quantity of 31,228 tons, and in value of $193,765. In addition to the quantity of pyrite consumed for acid manufacture, there is a very large amount utilized in pyritic and allied smelting, of which it has not been practicable to collect statistics. Doubtless, in the past few years, the total production of pyrite in the United States for all purposes approximated 275,000 tons annually.

During 1903 Virginia contributed a large portion of the total output of pyrite for acid manufacture, the producers being the Sulphur Mining & Railroad Company of Richmond, the Arminius Chemical Company of Mineral City, and Louis F. Detrick, of Dumfries, Va. In Massachusetts the Davis Sulphur-Ore Company is the chief producer, and in New York the High Falls Pyrites Company contributed the entire output of that State. There was no reported production of pyrites for acid manufacture in Colorado, and the quantity produced as a by-product in the mining of coal in Indiana and Ohio amounted to 5,882 short tons during 1903, as compared with 9,955 short tons in 1902.

The largest consumers of sulphuric acid in the United States, the Virginia-Carolina Chemical Company, the American Agricultural Company and the Standard Oil Company, now purchase the pyrite ores from which the acid is manufactured; and it may be said that fully 90 per cent of the total quantity of sulphuric acid in the United States is consumed for the different uses of these concerns.

Two sets of experiments have been continued during 1903, either of which, if ultimately successful, will have a very important bearing on the future of the pyrite industry. The first concerns the utilization of the by-product gases resulting from the roasting of zinc-blende ores, which has been demonstrated with financial profit at the zinc plants of Peru and La Salle, in Illinois, and of Argentine, Kansas. From 25 to 28 per cent of the sulphur content of the zinc ores can be saved during the first roast and subsequently utilized for acid making. The roasted product, containing about 2 per cent sulphur, is then dead-roasted in a Chase or other type of roasting furnace, the product becoming in proper condition to admit of the extraction of the zinc at a very low cost.

There are various supplies of sulphur in the zinkiferous sulphide ores of Arkansas, Missouri, Kentucky, Kansas, Colorado and other

Western States, and it is well within the range of probability that in the near future the tonnage of sulphur derived from pyritiferous ores will be largely augmented by the addition of ores of the zinc sulphide class.

The second set relate to the utilization of the pyrrhotite ores of the South for the manufacture of sulphuric acid. These experiments indicate that the sulphur can be so effectually removed from the ores that the roasted product will be of value in the manufacture of pig iron, or even of steel. Abroad, the residues from Spanish pyritic ores, treated by the Henderson process, are used in the manufacture of iron, but so far, in the United States, roasted pyrite residues have not been utilized for this purpose on account of the comparatively large percentage of sulphur remaining in them after treatment in the chemical works. Furthermore, the immense supplies of cheap bessemer ores in the United States have obviated the need to use any large quantity of roasted ores or by-products from other processes. If pyrite and pyrrhotite residues could be roasted so that the sulphur remaining after treatment would permit of their utilization for the manufacture of pig iron, there would result an annual saving of many thousand tons of iron from what is now a waste product.

ABSTRACTS OF OFFICIAL REPORTS.

Tomboy Gold Mines Company, Ltd.

This company operates the Tomboy, Argentine and some minor properties at Telluride, Colo. Its report is for the year ending June 30, 1903.

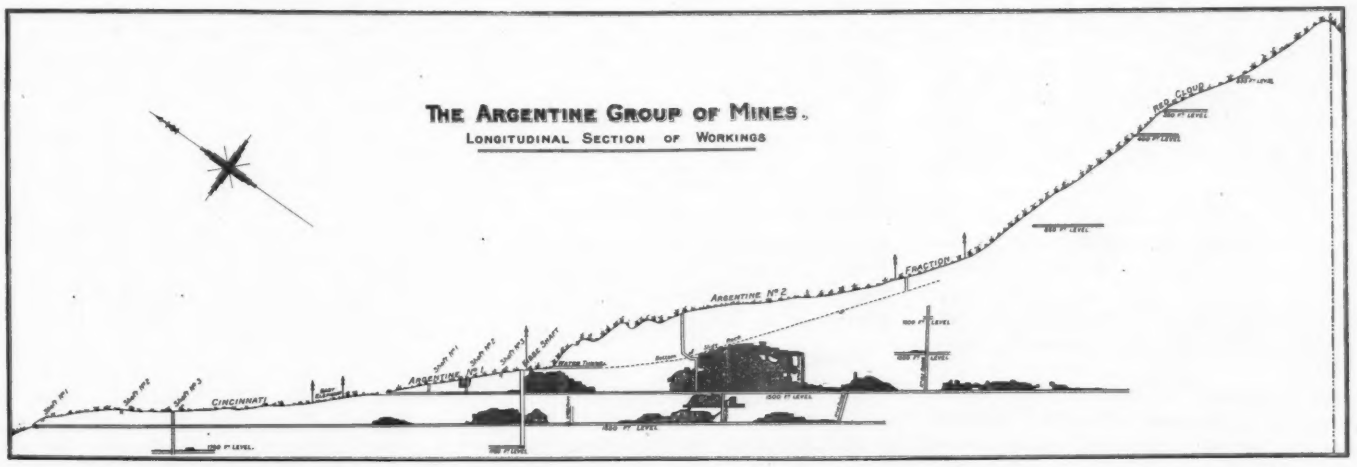
The mine report shows that the principal work during the year was on the Argentine mine. The development work included 98 ft. shaft sinking, 989 ft. raises, 12 ft. cross-cuts and 3,849 ft. drifts; a total of 4,948 ft. This work opened up a large quantity of good ore. The report is accompanied by a plan of the Argentine workings, which is reproduced herewith.

The total ore taken out and milled was 82,737 tons, dry weight. The yield from this ore was as follows, with the expenses and miscellaneous earnings:

	Amount.	Per ton.
Bullion	$600,416	$7.28
Concentrates	131,246	1.59
Rents, etc	20,147	0.25
Total earnings	$751,809	$9.12
Mining and development	$293,745	$3.56
Milling	139,099	1.69
General expenses	50,779	0.62
Total expenses	$483,623	$5.87
Net earnings	$268,186	$3.25

thanks to the tact and judgment displayed by the general manager, Mr. Herron, in dealing with the men. They viewed therefore, with the deepest regret, the interruption of the mutual good-feeling which had thus been established; but they felt that it was impossible to concede this demand consistently with their duty to the shareholders and their loyalty to the other members of the Telluride Mining Association. The directors are glad to be able to add that present indications point to a complete resumption of work at an early date.

The reports received from Mr. Herron as to the large tonnage of ore in course of development in the Argentine mine, pointed to the necessity of an addition to the existing mill in the near future; and with a view to arriving at a sound decision on this question, the directors, through the kind offices of the Exploration Company, obtained the consent of Mr. R. T. Bayliss and Mr. P. L. Foster to visit the property and confer with Mr. Herron on the spot. They have recently returned to London and fully confirm the general manager's advices. They have accordingly arranged with him a scheme for continuing developments during the next 12 months, at the end of which time there is, in their opinion, every probability that the board will be justified in adding 60



Another promising field for the consumption of pyrite is in making sulphur dioxide gas for the bleaching of wood-pulp in its manufacture into paper by the sulphite process. Heretofore, with one or two exceptions, sulphur only has been used for this purpose in the United States, although in Europe a large quantity of pyrite has replaced sulphur in the pulp-mills.

The subjoined table shows the quantity of pyrite consumed in the United States and the estimated quantity of sulphur displaced by it during 1902 and 1903, in long tons; imports and exports for December, 1903, being estimated:

	1902.	1903.	Changes.
Domestic product	228,198	196,970	D. 31,228
Imports	440,363	415,176	D. 25,187
Total supply	668,561	612,146	D. 56,415
Exports	3,060	1,452	D. 1,608
Consumption	665,501	610,694	D. 54,807
Sulphur displaced, estimated on basis of 45% content	299,475	274,812	D. 24,663

During the past decade the quantity of sulphur replaced by pyrite for acid-making has increased more than 200 per cent, due very largely to the increased production of phosphate rock in Florida and Tennessee, which does not require a chemically pure acid for conversion into superphosphate.

The profit and loss account, as stated in sterling from the London office, shows net earnings amounting to £55,012. The deductions from this were: General expenses and income tax, £3,418; directors' fees, £700; depreciation of plant and machinery, £5,000; total, £9,118, leaving a net balance of £45,894. The directors' report is, in substance, as follows:

The profit and loss account shows a net profit of £45,894, as above; which, with £1,092 brought forward from previous year, makes a total surplus of £46,986. Out of this the board had intended to recommend the payment of a dividend, but owing to the outbreak of the labor strike it has been deemed prudent to keep the cash resources of the company in hand. The mill had to be shut down on September 1 last, owing to a labor strike which commenced on that date, and which continued without intermission to November 25, when, under military protection, 20 stamps were restarted. The trouble was caused by the demand of the miners' union for an eight-hour day for millmen, which the Telluride Mining Association, representing the mine owners of the district, the company included, did not see their way to grant. It has always been the policy of the directors to cultivate the friendliest relations with their employees; and in this they have hitherto been successful, more stamps to the existing installation, raising it to 120 stamps in all.

The cost of these additional stamps and accessories would be about £25,000, and it is estimated that the carrying out of the scheme of development will involve the expenditure of an equal amount. The directors have also to provide £20,000 for the purchase of the Mountain Chief mine, the payments for which are spread over a period extending up to April 10, 1905. It is therefore possible that the total expenditure under these several heads, during the next 18 months, may amount to £70,000. To the extent of £20,000 it is hoped that it may be possible to meet this expenditure out of the general funds of the company; and the directors propose to provide for the remaining £50,000, should it be required, by means of a temporary loan. The terms upon which this will be made include an option to take repayment in shares of the company at 30s. per share. To provide for this it is necessary to create an additional amount of capital to be available for future issue.

The statement given above shows mine earnings and expenses. From this it will be seen that 82,437 tons of ore were milled, of which all but 9,156 tons came from the Argentine property.

In the Tomboy group, the ore remaining in

the lower levels being too low in grade to warrant extraction at the present time, these workings have been filled with water, which can be drawn on in case of any interruption to the supply from Lake Ptarmigan. A few tributors have been put to work in the upper old workings, and the ore thus obtained, to the amount of 7,374 tons, passed through the old Tomboy mill.

On the Argentine group, developments have been very satisfactory. The 3,852 ft. driven, raised and sunk, opened up large bodies of ore. Of the total ore treated 73,281 tons came from this property.

The Mountain Chief, the most recent acquisition of the company, adjoins the Tomboy group on the west, and the vein formerly worked by this company passes through it. Good ore was found in the old surface workings, but the inaccessible position of these prevented proper development. The long crosscut to the vein on the Tomboy 600-ft. level strikes within a few feet of the Mountain Chief boundary line, and the facility thus afforded for development made the property a desirable purchase to this company.

Of the properties mentioned in the last report as being under bond, the Columbia mine has been abandoned. The Fraction claim, lying between the Argentine No. 2 and the Red Cloud claims, has been purchased, and is proving very satisfactory.

The new 60-stamp mill began working on November 3, 1902, and was in continuous and successful operation until September 1, 1903, when the strike began, and the mill had to be shut down.

BOOKS RECEIVED.

In sending books for notices, will publishers, for their own sake and for that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of the ENGINEERING AND MINING JOURNAL.

Department of Agriculture. Report of the Forester for 1903. Gifford Pinchot, Forester. Washington; Government Printing Office. Pages, 40.

Department of Agriculture. Wages of Farm Labor in the United States. By James H. Blodgett. Washington; Government Printing Office. Pages, 64.

Notes on the Rocks of Nugsuaks Peninsula and Its Environs, in Greenland. By W. C. Phalen. Washington; the Smithsonian Institution. Pages, 32; illustrated.

Tonindustrie Kalender, 1904. Berlin, Germany; published by the *Tonindustrie Zeitung.* Part I, Yearly Calendar; Part II, Technical Notes; 764 pages.

Coal-Field Directory for the Year Ending April 1, 1904. Pittsburg, Pa.; Compiled and published by the Keystone Consolidated Publishing Company. Pages, 384. Price, $6.

Mineral and Crown Land Grants in Nova Scotia. By Edwin Gilpin, Jr. Ottawa, Canada; reprinted from the *Transactions* of the Royal Society of Canada. Pamphlet, 12 pages.

Treasury Department. Annual Report of the Commissioner of Internal Revenue for the Fiscal Year Ending June 30, 1903. John W. Yerkes, Commissioner. Washington, Government Printing Office. Pages, 276.

State of New York. Twenty-first Annual Report of the Railroad Commission. George W. Dunn, Frank M. Baker and Joseph M. Dickey, Commissioners. Albany, N. Y.; State Printers. Advance proofs, 80 pages.

Metallurgical Analysis and Assaying. A Three Years' Course for Students of Schools of Mines. By W. A. Macleod and Charles Walker. London; Charles Griffin & Company, Ltd. Philadelphia; the J. B. Lippincott Company. Pages, 332; illustrated. Price, $4.

On the Location and Examination of Magnetic Ore-Deposits by Magneto-metric Measurements. By Eugene Haanel, Dominion Superintendent of Mines. Ottawa, Canada; published by the Department of the Interior. Pages, 132; with eight plates and illustrations in text.

Geological Survey of Canada. Geological Maps of Nova Scotia. No. 42, *Trafalgar Sheet. No.* 43, *Stellarton Sheet. No.* 44, *New Glasgow Sheet. No.* 45, *Toney River Sheet. No.* 46, *Pictou Sheet. No.* 47, *Westville Sheet. No.* 48, *Eastville Sheet. No.* 56, *Shubenacadie Sheet. No.* 57, *Truro Sheet. No.* 58, *Earltown Sheet.* Ottawa, Canada; published by the Geological Survey. All sheets 12½ by 18½ in. Price, 10c. each.

United States Geological Survey. Geologic Atlas of the United States. No. 97, *Parker Folio, South Dakota.* Three maps, with 8 pages text. *No.* 98, *Tishomingo Folio, Indian Territory.* Four maps, with 10 pages text. *No.* 99, *Mitchell Folio, South Dakota.* Four maps, with 8 pages text. *No.* 100, *Alexandria Folio, South Dakota.* Three maps, with 8 pages text. George W. Stone, Editor Geologic Maps; S. J. Kubel, Chief Engraver. Washington; engraved and printed by the Geological Survey.

BOOKS REVIEWED.

Die Metallographie im Dienste der Hüttenkunde. By E. Heyn. Freiberg, Saxony, 1903; Craz & Gerlach. Pages, 43; illustrated. **Price (in New York), 35 cents.**

The purpose of this paper is to furnish the general reader with a brief résumé of the principles and aims of metallographic science. The subject is handled in a simple and illustrative way, requiring only a fair knowledge of physics and chemistry to follow intelligently, and yet the elements of the science are covered quite thoroughly. The little volume might well serve as an introduction to metallography for use in technical schools.

Oil, Gas and Glass, Chemical Industries and Minerals in Kansas. By G. P. Grimsley. Topeka, Kansas, 1903; prepared and published for the Department of Labor and Industry. Pages, 32; with maps and illustrations.

This pamphlet is a reprint from the report of the Kansas Bureau of Labor and Industry for 1902, and has been issued to supply the public with information relative to the gas and oil industries of that State. Although these resources have undergone only small developments as yet, they are believed to be of great potential importance, and will doubtless receive increased attention in the immediate future. The paper reviews the present conditions surrounding the industries, and gives practical information regarding the occurrence, production and utilization of oil and gas.

Estadistica Minera de España, correspondiente al Ano de 1902. Compiled and published by the General Bureau for the Inspection of Mines. Madrid, 1903; Government Printers. Pages, 180; with map.

The present report, which corresponds in scope with the issues in preceding years, includes statistics of production and reviews of mining progress in Spain during the year 1902. There are tables showing the total production of Spanish mines classified according to substance produced, and more detailed statements of the output by mining districts.

Ueber die Bedeutung der Freiberger Bergakademie für die Wissenchaft des 18 *und* 19 *Jahrhunderts.* By A. Ledebur. Freiberg, Saxony, 1903; Craz & Gerlach. Pages, 31; illustrated. Price (in New York), 50 cents.

This paper gives the text of the inaugural address delivered last year before the Freiberg Mining Academy by Professor A. Ledebur, upon assuming the duties of rector in that institution. As might be expected from the title of the discourse, it passes in review the eventful history of the school, and shows the important part its students and professors have taken in advancing the science and technology of mining throughout the world. The academy, as is well known, is the oldest of all our mining schools, the first lectures being given in Easter-tide, 1766, in the same building in which the present rector was installed. Many interesting notes are recorded relating to the lives and services of former Freiberg professors, and the paper will be welcomed as throwing new light upon the past history of this honored institution.

Across the San Juan Mountains. By T. A. Rickard. New York and London, 1903; THE ENGINEERING AND MINING JOURNAL. Pages, 115; illustrated. Price, $1.

A horseback ride through the mining districts of the San Juan in southwestern Colorado is the theme of this pleasing narrative. The party of four engineers started from Ouray, riding through Telluride, Silverton, Lake City and Gunnison to Crested Butte, and thence back to Ouray—a region associated with splendid achievement in the development of the mining and metallurgical industries of the West and one that retains a large measure of past importance. Interwoven with the incidents and impressions during the ride of 400 miles, there are many interesting notes on the history and present status of mining in the San Juan. The writer visited the plants and workings of the Tomboy, Argentine, Smuggler-Union, Camp Bird and other prominent mines, and from personal observation gleaned a great deal of information of scientific or technical interest. Withal, the book has the charm that comes from a keen appreciation of nature and her varying moods; the frequent bits of description, revealing impressions from the ever-changing panorama of mountain scenery, give freshness and life to the story, which makes its reading thoroughly enjoyable. The geologist and engineer, as well as the general reader interested in the romance of mining in the West, can turn to this little volume with pleasure and profit.

CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.
Letters should be addressed to the EDITOR.
We do not hold ourselves responsible for the opinions expressed by correspondents.

Gold on the Saskatchewan.

SIR.—In your issue of December 31 "Prospector," from Toronto, asks about what prospecting for gold has been done on the Saskatchewan river, and suggests it, in view of the opening of the Canadian Northern Railway this year, as a good place to prospect. All he says about the natural advantages of the country is true, and it would be hard to find a more delightful country to work in.

Two years ago I was engaged to look up the prospects of the Saskatchewan for gold-dredging, and if the results of my investigation at that time will save some poor prospector a lost summer I will be well rewarded. If "Prospector" wants to make a few dollars during a limited season, let him got to the Saskatchewan after a flood and wash the gravel in pan or rocker; but if he is looking for a placer deposit of any richness or permanence he had better go elsewhere.

Perhaps no river in the West has been more thoroughly explored, the first expedition of which any record remains having been sent out by MM. Bigot and de la Jonquière in 1750. From that time to the present, one party after another has traversed this region, and many people have studied the geological formation minutely and carefully.

The consensus of opinion seems to be that the gold is "scattered in small quantities through the rocks of the Edmonton series in the vicinity of the Big Coal seam on the North Saskatchewan," about 50 miles above Edmonton, and perhaps for some distance east or down stream, but nowhere is it found above this point. "The river annually washes a large quantity of these soft rocks from its banks and separates the gold" by assortment, carrying some of it for 200 miles. It has long been a custom for the farmers of the vicinity to wash the same bars over and over after each successive flood, thus pretty thoroughly proving this part of the theory.

Now, taking up the theories and proofs of small deposits near the Big Coal seam; a number of specimens of the clay, slag-like rock, etc., at the highest point on the river where gold is found, were taken at points a mile apart and assayed, in every case showing small quantities of gold, while samples of the overlying boulder clay did not show gold. From these and similar proofs, Dr. Selwyn "recognized the fact that the gold in the Saskatchewan was not derived from the mountains at its source, but rather was washed out of the soft rocks which form its banks, after it leaves the harder strata of the mountains; and he considered that it was disseminated throughout the drifts composed of granitoid gneiss with hornblendic and micaceous schist, quartz and limestone, which are spread over the face of the country for hundreds of miles, and which must have been themselves largely derived from the denudation of the great belt of Laurentian and other crystalline rocks."

"The question of the source from which the gold was originally derived, therefore, involves that of the material which forms the sandstones and clays of this series, but the information at hand for the determination of that point is very small."

So far as I know, two theories have been advanced for the origin of the gold. One that it results from the glacial denudation of the rocks in the vicinity of the Lake of the Woods; the other, and perhaps more probable, that the original rivers rose in the Selkirks and flowed eastward into the sea now occupied by the Edmonton series, and that subsequently the Rocky Mountains were elevated and the inland sea filled up, the country assuming its present aspect.

In any event the deposit is one where it is mere conjecture to look for the original source of supply. If "Prospector" wishes to look into the theories and details I would advise him to read the 'Report on Northern Alberta,' by J. B. Tyrrell, published by the Geological Survey of Canada, from which I have quoted above, as giving the precise language of a very detailed examination of the Saskatchewan.

In regard to the dredges, I am creditably informed that they are having difficulty in making a profit, because of the uncertainty of the water supply—a season of floods and then of drouth—the fineness of the gold, and the immense quantity of black sand which obscures the gold and makes it difficult to save. Two years ago a large company had secured government rights for dredging, etc., on the river from Edmonton to Prince Albert, and were trying to farm out, on a royalty, 10-mile sections to any one guaranteeing to put a dredge on said section. What success they have met with, or whether their concession has lapsed, I cannot say.

Since 1887 the amount of gold taken out of the Saskatchewan has ranged from $1,200 to $55,000 yearly; and the amount taken out up to 1899 was $282,946 in all.

S. H. BROCKUNIER.

Wheeling, West Va., Jan. 9, 1904.

QUESTIONS AND ANSWERS.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc.; preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Assessment Work on Claims.—At the organization of the Loon Creek Mining District, Custer county, Idaho, in July, 1903, by the claim-owners of that district, there was incorporated into the local laws a clause that $5 per diem should constitute a day's pay for the purpose of performing annual assessment work, and that the $5 should include all expenses for supplies, etc. About eight months prior to the organization of said district, however, a mining company, working eight to ten men, had been working within the district, doing development work, and paying its men $3.50 per diem, deducting $1 per diem for board and furnishing mining supplies required. Also, since the district was organized, other mining companies, operating therein, have paid $3.50 per diem for assessment work, furnishing mining supplies, the men boarding themselves. However, a number of private claim-owners have paid for the $100 annual labor required at $5 per diem, contending that the local law to that effect was valid; and that $5 was not an excessive amount for a day's pay, in view of the inaccessibility of the district, high cost of mining supplies, provisions, etc. Loon Creek, by the way, is 25 miles from Custer, freight being 2.5 per lb., while prices in Custer for provisions, mining supplies, etc., are reasonable.

The question desired answered is, to wit: Will $100 worth of work performed at $5 per diem, in view of the circumstances above stated, constitute a legal assessment work?—L. B.

Answer.—On this point Lindley's 'Treatise on American Law Relating to Mines and Mineral Lands,' Section 635, second edition, gives the following statements:

"In some of the mining districts attempts have been made to fix the value of a day's labor, and in Nevada and New Mexico we encounter statutes prescribing the number of hours which shall constitute a day's work upon a mining claim, and providing that such day's work shall be of the value of four dollars.

"It seems to us that it is not within the power of any State or Territorial Legislature or local district assemblage to arbitrarily fix the value of any marketable commodity. This class of legislation contravenes the Federal law."

The following instruction upon the method of determining values has been approved by the Supreme Court of Montana: "In determining the amount of work done upon a claim, or improvements placed thereon for the purpose of representation, the test is as to the reasonable value of the said work or improvements—not what was paid for it or what the contract price was, but it depends entirely upon whether or not the said work or improvements were reasonably worth the said sum of one hundred dollars.

"A mere expenditure is not sufficient. The work must tend to develop the claim and be of the reasonable value claimed.

"Cost is an element in establishing value, and, while not conclusive, strongly tends to establish the good faith of the claimant.

"It is not material whether the labor performed is paid for or not, provided it is done at the instigation of the owner. The fulfillment of the provision of the law lies in the performance of the labor or the making of the improvements required, and not in the payment for it.

"Experience teaches us that this question of value of annual labor forms the basis of innumerable controversies. Every re-locator is interested in depreciating the value of work performed by the original locator, and the latter, in saving his claim from forfeiture, is interested in extolling its worth. It is largely a question of opinion, upon which both practical miners and experts will disagree."

It would be well to secure good legal advice in the case of your district. Such advice now may avoid future trouble and litigation over claims.

RUSSIAN TARIFF ON ZINC.—The Russian government has removed temporarily the tariff on perforated zinc plates, which are intended for use in the gold-mining industry. To obtain the exemption, an official voucher, giving the name of the purchaser and authenticated by the local mining authority of the district in which the zinc is to be consumed must be presented to the customs officials.

RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

SPECIALLY REPORTED.

DUTY ON RETORT CARBON.—Retort carbon, the residuum that accumulates on the inside of gas retorts in the manufacture of gas out of bituminous coal, is dutiable as coke, under paragraph 415, act of 1897, at 20 per cent ad valorem, and not as an article composed of carbon, under paragraph 97, act of 1897, at 35 per cent ad valorem. The enactment of the provision for articles and wares of carbon, in paragraph 97, act of 1897, does not change the rule for the classification of retort carbon.—Appeal of E. P. Earle from Collector of Customs at New York; Board of General Appraisers.

DUTY ON PIPES OR TUBES COMPOSED OF COPPER AND IRON.—Pipes or tubes composed of copper and iron, although in chief value of copper, do not fall within paragraph 176, act of July 24, 1897, which provides for copper pipes. Only pipes or tubes composed entirely of copper fall within that provision. Such articles, being manufactures of metal not specially provided for, are dutiable under paragraph 193 at the rate of 45 per cent ad valorem.—Appeal of S. H. Collom from Collector of Customs at Philadelphia; Board of General Appraisers.

POSSESSORY TITLE TO MINING CLAIM IN ALASKA.—Under section 475, Code Alaska (Act June, 1900, 31 Statute, 410, c. 786), providing that any person in possession of real property may maintain an action of an equitable nature against another who claims an estate or interest in same adverse to him for the purpose of determining such claim, and the law of the United States (Compiled Statutes 1901, p. 679), which provides that no possessory action for the recovery of any mining title shall be affected by the fact that the paramount title to the land is in the United States, but each case shall be adjudged by the law of possession, one in possession of a mining claim in Alaska under a valid location has such title as will support an action to quiet title against an adverse claimant.—Fulkerson v. Chisna Mining & Improvement Company (122 *Federal Reporter*, 782); United States Circuit Court of Appeals.

RIGHT TO BRING EJECTION SUIT WHERE PAYMENTS ARE NOT MADE.—Where a contract for the sale of a mining claim provided that an intermediate payment of $10,000 should be made, and, if default was made in any of the payments, the property should revert, with all improvements, to the seller, the buyer assigned his contract to a mining corporation, without the knowledge or consent of the seller, an oral demand by the seller, or his agent, on the buyer, requiring payment or delivery of the property, was sufficient to entitle the seller to maintain ejectment as against both the purchaser and his assignee; there was no necessity of rescinding the contract and offering to return the money that had been paid; nor was there any necessity to await until final payment was in default; the provision for reversion on default was not a term used merely to promote expedition of payment, but made time of the essence of the contract.—Williams v. Long (72 *Pacific Reporter*, 911); Supreme Court of California.

PATENTS RELATING TO MINING AND METALLURGY.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending January 5, 1904.

748,576. PIVOTED-BUCKET CONVEYOR.—Eugene Bivert, Chicago, Ill., assignor to Fairbanks, Morse & Company, Chicago, Ill. The combination with a bucket of the class described, of a bail in the ends of which the bucket is pivoted, track-wheels on each side of the bail, on all of which said bucket is carried in horizontal position when loading and on two of which the bucket is carried in vertical position approaching the dumping position and a latch adapted when released to permit the bucket to swing to a dumping position.

748,577. TRIPPER FOR BUCKET CONVEYORS, ETC.—Eugene Bivert, Chicago, Ill., assignor to Fairbanks, Morse & Company, Chicago, Ill. A tripper for the purpose specified comprising in combination a track, a truck movable on the track, a downwardly-inclined cam-surface thereon and a part carried on a bucket adapted to engage beneath the cam and dump the bucket.

748,595. METHOD OF WATERPROOFING AND FINISHING THE SURFACE OF STONE, BRICK OR OTHER ANALOGOUS POROUS MATERIAL.—Neal Farnham, Chicago, Ill. A within described method of waterproofing and finishing the surface of stone, brick and other analogous porous material consisting of heating the porous material and while heated applying a waterproof compound to the heated surface and subsequently hardening the surplus of the compound and removing it from the surface by a blast of sand and air.

748,609. PRODUCTION OF HYDROXIDES AND OXIDES OF METALS BY ELECTROLYSIS.—Frederick F. Hunt, New Brighton, N. Y., assignor of two-thirds to Maas & Waldstein, New York, N. Y. A process which consists in passing a current of electricity through a suitable electrolyte having both the electrodes formed of the metal whose hydroxide or oxide is desired, and making each electrode the anode and the cathode, alternately, at suitable intervals, and thereafter collecting and amassing said hydroxides and oxides as separate bodies apart from the electrodes.

748,611. ART OF MAKING CEMENTITIOUS PRODUCTS OR ARTIFICIAL STONE.—William E. Jaques, Grand Rapids, Mich., assignor to Alfred O. Crozier, Grand Rapids, Mich. An improvement consisting in partially compacting a mass composed of a somewhat moist porous cementitious material upon a semifluid and practically non-porous cementitious layer which forms the lower exterior surface of the entire mass; then applying pressure upon the originally-compacted mass and added semi-fluid cementitious matter, and then permitting the product to set and harden.

748,632. MINERS' SAFETY-LAMP.—Marshall G. Moore, Johnstown, and Ralph V. Sage, borough of Westmount, Pa. In a miners' safety-lamp, a hollow cylindrical lamp-glass, a supporting-ring for same adjustably screwed in the base of said lamp, a flanged annular abutment secured to the frame of the lamp above the top of the lamp-glass, an outer gauze hood provided with a retaining-ring of L-section, an inner gauze hood provided with a retaining ring of Z-section.

748,662. PROCESS OF TREATING COPPER ORES.—Amédée M. G. Sébillot, Paris, France. A process for extracting pure metals from mineral ores, consisting in treating the ores with sulphuric acid at the evaporating-point of the latter, without roasting, to form sulphates, condensing the surplus acid fumes, and lixiviating the sulphates in successively deeper baths under constant agitation, in a current flowing in direction opposite to the progress of the ores.

748,687. PROCESS OF GENERATING GAS.—Frank H. Bates, San Francisco, Cal. A process of vapor-generation, which consists in heating a body of oil, the volume of which is kept constant by fresh additions, until, by the mixture of the ever-increasing residue with the fresh oil, the mass becomes too impoverished to yield vapor of the required richness, and thereupon cutting off the fresh additions of oil to said body; then heating a second body of oil, whose volume is kept constant in like manner as the first body, continuing, meanwhile, the heating of the first body, and mingling with the impoverished vapor of the first body the richer vapor of the second body, until the first body has ceased, substantially, to yield any useful vapor.

748,693. POWER-DRIVEN ROCK-DRILL.—William A. Box, Denver, Colo., assignor of one-half to Eugene Y. Sayer, Denver, Colo. The combination of a casing, a rotatable tool supported thereby, a piston movable in the casing independently of the tool and constituting a hammer for striking the tool, an independently movable plunger located in the casing axially in line with the piston and behind the same, and means for reciprocating the plunger in the casing behind said piston to alternately compress the air behind the piston and cause a vacuum behind the same, whereby the piston is actuated to strike the tool and return at each stroke of the plunger.

748,712. ROCK-DRILLING MACHINE.—Albert Fauck, Vienna, Austria-Hungary. A rock-drilling machine having a support, a carriage movable longitudinally thereon, means to move the carriage, a reciprocatory drill-bar, a driving-shaft and a pulley carried by the carriage, a spring to move the drill-bar in one direction, an eccentric on the driving-shaft, a cord having its ends connected respectively to the carriage and drill-bar and having oppositely-extended bights engaging the pulley and eccentric, and a motor to drive the shaft and carried by the carriage.

748,739. PROCESS OF MAKING BRIQUETTES.—Wilhelm Huffelmann, Duisburg, Germany. The process of making briquettes of fine ores, granulated ores or sand ores for use in the blast-furnace, consisting in mixing said ores with coke or charcoal reduced to the same size of corn as the ores; completely drying these materials in a drying apparatus where they are more intimately mixed and freed from humidity; raising the dried and mixed materials in hot state into a mixing mill where liquefied tar is added thereto by blowing the tar by means of a steam-jet and tuyeres into the mixing mill, thereby finely surrounding each ore and coke particle with tar; after which the complete mixture of ore, carbon and tar is passed through a press in which it is moulded into briquettes of suitable size under heavy pressure.

748,804. DREDGING-MACHINE. — William H. Smyth and Alphonzo B. Bowers, San Francisco, Cal. A suction pipe provided with a device having projections extending beyond its normal surface adapted to engage with and remove obstructions from the mouth of said pipe and mechanism to actuate said device independent of the water-flow.

748,809. TUNNELING APPARATUS.—Roy Stone, New York, N. Y. The combination with a tunnel-casing, of an excavating-shield surrounding said casing and having an advancing cutting edge and dividing-bulkhead, annular inflatable packing devices and seats for holding and securing the same to said shield, said packing devices being interposed between the shield and the forward tunnel-sections and advancing with the shield for maintaining a tight joint.

748,819. CONCENTRATOR.—Louis R. Tulloch, Angels Camp, Cal. In a concentrator, the combination of the belt, means for oscillating the same, a percussion-box, means operated with the oscillating means for shaking the box longitudinally of the belt, said box comprising a hopper into which the material is fed, a vertical series of tables onto which the material is successively distributed, and individual longitudinally-slotted plates above said tables for distributing the material evenly over the tables.

748,820. STAMP-MILL ATTACHMENT.—Louis R. Tulloch, Angels Camp, Cal. The combination, with the cam and tappet, of a movable element arranged to be interposed between the cam and tappet to lift the latter by means of the former, a vertical shaft having a crank-arm pivotally connected with said element, a prop and stem therefor rising and falling with said element, a suitable bearing for said stem, a vertical lever, means operated by said lever for rotating said shaft to interpose said element to raise the tappet, and a slide pivoted to the lever, whereby the further continued movement of the lever moves the slide beneath said stem to support the prop and tappet thereon.

748,842. CASE-HARDENING COMPOUND.—Jos. Cadotte, Suncook, N. H.—A case-hardening dry compound composed of 40 per cent of white calcined plaster, 40 per cent of prussiate of potash and 20 per cent of lampblack.

748,898. HYDRAULIC AIR-COMPRESSOR.—William O. Webber, Boston, Mass., assignor to Walter C. Carr, New York, N. Y. In a hydraulic air-compressing apparatus, a down-flow-pipe consisting of a plurality of vertical passages, operatively connected to a head-tank above, and to a separating-chamber below, provided with means for shutting off one or more of said passages.

748,901. MINING-PICK.—George T. White, Colfax, Iowa. The combination of a pick-head containing, in its under surface, a depression having right-angular sides, an inclined slot, extending upwardly and outwardly from its under surface, an inclined channel extending from the upper to the lower surfaces and inclined reversely to the plane of slot; a socket, having two flattened sides, an outwardly-inclined shank extending upwardly from its top surface, an internally-screw-threaded opening extending downwardly from the top surface on a plane inclined reversely to the plane of the shank, an opening extending upwardly from the under surface, a wedge located centrally in the top surface of the opening and extending downwardly therefrom, and a set-screw.

748,933. APPARATUS FOR THE MANUFACTURE OF GAS.—Robert Dempster, Marietta, Ohio, The combination with a retort, of a compressed-air reservoir, a supply-pipe leading therefrom to one end of the retort, an oil-tank, an air-supply pipe connecting the upper portions of the reservoir and the oil-tank, and a supply-pipe leading from the oil-tank to the opposite end of the retort for admitting a mingled jet of air and oil to said retort.

748,935. BLASTING-CARTRIDGE.—Thomas F. Durham, Philadelphia, Pa. In a safety blasting-cartridge, an outer tube closed at one end, said closed end being formed tapering or conical, an inner tube also closed at one end, the open end of each tube being interiorly threaded, screw-threaded plugs adapted to close said open end, the interiorly-threaded mouth of the outer tube being formed eccentric with the body of the tube, the shoulder thus formed upon one side being provided with an opening extending to the interior of the tube, the inner tube being provided with an opening through its side, a fuse adapted to extend from the exterior of the cartridge through said opening to the interior of the inner tube, and the holes adapted to be closed around the fuse by a plastic waterproof solution, projections extending inward from the outer tube to hold the inner tube at a distance from the outer tube, and projections extending inward from the conical end of the outer tube upon which the inner tube is adapted to rest.

748,943. PROCESS OF MANUFACTURING HYDRAULIC CEMENT.—Julius Gresley, Liesberg, Switzerland. Process for producing hydraulic cements by burning artificially and intimately mingled mixtures of aluminum silicates with lime, especially in form of carbonate, and with a slight addition of a sulphate.

748,962. SAFETY APPLIANCE FOR MINING-HOISTS.—Joseph Lewis, Sault Ste. Marie, Canada. In a safety device for hoisting apparatus, the combination with a cage, of vertical guides between which the cage travels, a cable for raising and lowering the cage, tongs arranged to grip the guides and hold the cage stationary, flexible connections between the tongs and the hoisting-cable arranged to hold the tongs inoperative while the hoisting-cable is taut, and means connected to the cage and constructed to automatically cause the tongs to clamp the guides and prevent the descent of the cage when the cable becomes slack.

748,985. APPARATUS FOR ELECTROLYTIC DECOMPOSITION OF ALKALI CHLORIDES.—Johan J. Rink, Elsinore, Denmark. The combination, with a horizontally-moving mercury cathode, of a series of combining-cells without anodes, and a series of decomposition-cells provided with anodes, said combining-cells being of such dimensions that they expose about twice the area of surface to the solvent in the combining-cell as the cathode-surface exposed in said decomposition-cells.

749,038. PAN CONVEYOR.—James M. Dodge, Philadelphia, Pa., assignor to the Link Belt Engineering Company, Philadelphia, Pa. The combination of two endless chains connected together. pan-sections mounted between the chains, one section over-lapping another, and two links on each side of each pan-section by which the said sections are suspended from the chains, said links being so arranged that each section can be tilted to discharge its load.

749,040. MECHANISM FOR SEPARATING LIQUID AIR INTO ITS CONSTITUENTS OXYGEN AND NITROGEN.—Horace Dumars, Glenridge, N. J. The combination of two liquid-air vessels; an oxygen receptacle or tank located below said vessels and connected therewith; and a counter-current interchanger having a high-pressure incoming pipe provided with two branches, each of which branches passes into and through one of said liquid-air vessels and delivers to the other one.

749,049. MACHINE FOR HANDLING INGOTS OR LIKE PIECES UNDER THE HAMMER.—George P. Foy, Homestead, Pa.; Lizzie Foy, administratrix of said George P. Foy, deceased, assignor of one-half to Arthur Neill, Pittsburg, Pa. In a machine for handling an ingot or the like, the combination, with a car, of a bed rotatably mounted thereon, a base-plate adapted to be moved across the bed, standards carried by said base-plate, a vertically-movable frame mounted so as to slide in the standards, means carried by the frame for holding the ingot or like piece of material, and means for controlling the vertical movement of the frame.

749,058. COKE-DRAWING MACHINE.—John A. Hebb, Uniontown, Pa., assignor to the Hebb Coke Drawer Company of Uniontown, Pa. In a coke-drawing machine, the combination with a longitudinally-movable beam provided with a scraper, of screw mechanism for raising and depressing the beam.

749,091. WOOD-CARBONIZER.—Frederick M. Perkins, Boston, Mass. In a wood-carbonizer, a carbonizing-chamber to receive the wood to be carbonized, a furnace within the walls of the carbonizing-chamber and within which heat is generated to carbonize the wood in said chamber, a flue from said furnace having branch flues communicating with the carbonizing-chamber, said flue and branch flues also located within the walls of said chamber, and an exhaust-flue from the carbonizing-chamber.

749,104. CONCENTRATOR.—Ludwig F. Schoenefeldt, Denver, Colo., assignor of two-thirds to Rockwell M. MacCormac, Denver, Colo. A concentrator, comprising a series of cups, a rotary part carrying the cups, outlet-tubes extending from the bottoms of the cups and having rotative bearings in said rotary part, means for imparting rotary motion to the cups, a hopper, and conveyers for material, leading from the hopper to the several cups.

749,115. MANUFACTURE OF STEEL AND INGOT-IRON.—Benjamin Talbot, Leeds, England, and Paul Gredt, Luxemburg, Germany, assignors to the Continuous Metal Refining Company, Philadelphia, Pa. The process of manufacturing steel and ingot-iron consisting in first purifying a charge of metal by blowing it in a Bessemer converter or similar vessel then running off a portion of the charge, then adding to the remainder a further charge of impure metal and blowing the combined charge.

749,123. MAGNETIC LOCK FOR MINERS' SAFETY-LAMPS.—August Wiedenfeld, Bochum, Germany. In magnetic locks for miners' safety-lamps, the combination with the casing of the lamp, of a bolt swinging on a point below the horizontal center and substantially at mid-length whereby the volume of the bolt is distributed in substantially equal parts on both sides of said swinging point.

749,140. FILTER-PRESS.—Ernest B. Hack, Denver, Colo., assignor to the American Filter-Press Extraction Company, Denver, Colo. A filter-press composed of pulp-holding and filtering members suitably arranged and connected and provided with registering openings forming longitudinal passages outside of the pulp and filter chambers, each pulp-frame having a lateral channel leading from said passage for the introduction of pulp to the various pulp-chambers, and a distinct lateral passage for the introduction of fluid, a portion of the pulp-frames having two lateral channels for the introduction of fluid, one for liquid and the other for air; the filtering members having efflux or discharge channels for the escape of the solutions after they have passed through the pulp of the pulp-holding frames.

Week Ending January 12, 1904.

749,185. ELECTRODE.—Rudolph Hager, Halensee, near Berlin, Germany. An electrode of the Planté form comprising separate plates coaxially arranged, each plate being composed of a series of channel-shaped plates arranged one above the other, each channel-shaped plate being provided with a slit extending transversely of the channel therein.

749,197. HYDRAULIC GOLD-MINING.—Frederick J. Hoyt, Chicago, Ill. In a hydraulic mining apparatus a float or scow provided with an opening through its deck and bottom to the water, a sectional caisson adapted to fit within and extend through said opening in such manner that in its working position its top is always on a level with the deck, a common mechanism for lowering said caisson to the river-bed and for forcing it therein to any desired depth in one continuous operation and for raising said caisson from the river-bed and power means for driving said mechanism.

749,198. HOISTING AND CONVEYING APPARATUS.—Ole Johnson and John Johnson, Milwaukee, Wis. The combination of two hoisting-buckets of the clam-shell variety each provided with means for automatically locking it in open position, of a closing and hoisting line for each bucket, a winding apparatus common to said lines, means for rotating said winding apparatus and mechanism for automatically changing the direction of rotation of said winding apparatus at the desired times in relation to the position of said buckets.

749,207. DEPOSITORY FOR COAL OR THE LIKE.—George C. Mackrow and Herbert G. Cameron, Blackwell, London, England. The combination with a sloping partition dividing the depository into an upper chamber for the material and a lower chamber into which the material is received and handled, an outlet at the lower part of the partition through which the material may gravitate to the lower chamber, and a receiving-table in the lower chamber below the outlet upon which the material falls and comes to rest and from which it may be subsequently removed.

749,240. STONE-DRESSING MACHINE.—William B. Stoughton, Rockton, Pa., assignor of one-half to C. M. Kresge, Dubois, Pa. In a stone-dressing machine, a plurality of bits, actuating means therefor, a guide supporting and directing said bits in their reciprocating movements, wedges forming an adjustable support for said guide, and means for securing the guide in an adjusted position.

749,258. IRON-FOUNDING.—Haggert S. Cochran, Kansas City, Mo., administrator of Adam Cochran, deceased. A process of purifying and refining iron, consisting in first charging the cupola with fuel and metal and raising the heat of the contents thereof to a high temperature by an air-blast; second, injecting steam in an angular downward direction through the mass of molten iron and incandescent fuel, said steam entering the cupola at about 10 in. below the melting-point of iron.

749,280. SEPARATOR.—Oliver S. Emerson, Luxora, Ark. A casing having a level floor, an endless-belt conveyer having its upper lead supported upon said floor, and extended through openings at the ends of the casing, induction means at the head of the casing which is entered by the upper lead of the endless carrier-belt, and an inclined door pivotally mounted at the tail end of the machine and bearing against the upper surface of the upper lead of the endless-belt carrier to admit of the escape, under the edge of said door, of material passing through the casing.

749,282. RESERVOIR FOR STORING PETROLEUM.—Phillip Englund, Chico, Cal. A structure comprising a reservoir having bottom and lateral liquid seals, and means for maintaining the liquid in the bottom seal at a predetermined level.

749,302. MANUFACTURE OF GAS.—William A. Köneman, Chicago, Ill. A method of economically manufacturing gas, which consists in introducing steam into a producer containing a bed of carbonaceous material, and conducting into said producer, from an operating electric furnace surplus heat, practically free from nitrogen, from the arc therein to generate gas from said carbonaceous material and supply to the producer an amount of heat greater than the amount thereof abstracted by dissociation of the water-vapor.

749,311. APPARATUS FOR BURNING SULPHUR.—John A. Marsden, Lyon Falls, N. Y., assignor to A. R. Paul, Lyon Falls, N. Y., and Andrew Tromblee, Carthage, N. Y. In a sulphur burning or oxidizing apparatus, a rotary cylindrical retort having reduced axial openings in the ends and divided as to a portion of the interior by longitudinal partitions which do not extend to either of said openings.

749,322. PROCESS OF TREATING OILS.—Frederick B. Pope, Augusta, Ga., assignor of one-half to

Magnus Swenson, Chicago, Ill., and Lamar L. Fleming, New York, N. Y. A process of treating oil, which consists in heating the oil to a high temperature immediately after it leaves the press, and then separating the oil from the free acid and other impurities while in such heated condition.

749,326. DRYING AND ANNEALING STOVE.—Arpad Ronay, Budapest, Austria-Hungary. The combination of a chamber, passage-ways in said chamber, cylindrical inlet and discharge apertures for said chamber, shafts rotatably mounted in said apertures, radial plates secured to said shafts and adapted to close said apertures at all times, and packing-strips on said plates adapted to engage the walls of said apertures.

749,369. ROCK-CUTTING DRILL-BIT.—Lafayette Durkee, Denver, Colo., assignor to the Mine & Smelter Supply Company, Denver, Colo. In a rock-cutting drill, the combination of a suitable drill-shank having a chuck-holding end, with a rock-cutting end, comprising four radial ribs extending substantially axially with said shanks, and forming an integral part thereof, two oppositely-disposed sets of ribs, one set of which sets extends beyond the opposite set a short distance and forms a chisel-shaped cutting-edge at the end of the drill-bit, and having the opposite corners of the two longest ribs beveled in opposite directions, and an inverted-V-shaped cutting edge at the center of said chiseled edge, and a suitable cutting edge on the terminal edges of the two opposite shorter ribs.

749,403. MOVABLE SWINGING-BODY FURNACE FOR MELTING STEEL, ETC.—Louis Rousseau, Paris, France. A furnace for melting metals comprising a fire-chamber, provided below with a bent grate mounted upon an axis carried by the lower part of the refractory furnace-lining, a partition in the fire-chamber supported upon the refractory lining and provided with an opening; a plumbago crucible provided with a neck and supplied beneath with legs supported upon the lower wall of the refractory lining, a flue traversed by the legs and arranged between the crucible and the lower and side refractory lining.

749,413. KILN.—John F. Warwick, Chicago, Ill. The combination with the peripheral wall of a kiln, of a steel jacket incasing same, said jacket being composed of a plurality of segmental sections yieldingly secured together at their ends.

749,417. HYDRAULIC NOZZLE AND JOINT.—John A. Yeatman, San Francisco, Cal. An improved hydraulic discharge-pipe comprising fixed and movable pipe-sections, with flanges upon their contiguous ends; an annular thrust-collar bolted to one of the flanges and having a flange projecting inwardly over the uppermost of the pipe-flanges; an antifriction-bearing between the last-named flanges; a flexible disk secured between the pipe-flanges, said disk having its inner edge projecting and turned over the joint between the flanges, whereby said projecting portion will be forced against the inner wall of the pipe-sections and the joint, to prevent leakage at the latter; a discharge-pipe jointed to the movable pipe-section; a cap fitting over the end of the discharge-pipe and having an inwardly-extending flange; and a removable annulus fitting the cap from the inside and clamped between the flange thereof and the end of the discharge-pipe.

749,418. METHOD OF MAKING CARBON ARTICLES.—Edward G. Acheson, Niagara Falls, N. Y. Method of heating without substantially graphitizing carbon articles, which consists in embedding the carbon articles in suitable resistance material, converting electrical energy into heat energy within the mass of resistance material, and conducting sufficient of the heat energy thus produced into the bodies of the carbon articles to cause them to be polymerized.

749,460, 749,461 and 749,462. ELECTRIC FURNACE.—Le Roy W. Stevens and Bernard Timmerman, Chicago, Ill., assignors to Advance Furnace Company of America. In an apparatus for making carbide or the like, a treating-chamber through which the material passes, an auxiliary treating-chamber, means for conducting the gases from said auxiliary chamber to said first-mentioned chamber within the zone of the passing material, and means for creating a downdraft in the first-mentioned chamber.

749,490. INGOT AND PROCESS OF FORMING SAME.—Horace W. Lash, Minneapolis, Minn. An improvement in the art of forming metal ingots that consist in preparing a mass of molten steel, then inserting a piece of cold metal into said mass, thereby causing the molten steel to form or settle upon the exterior of said piece and thus form an ingot and then withdrawing such ingot from the molten mass prior to the general solidification of said mass.

749,500. MINERS' ELECTRIC LAMP.—Henry G. Prested, Camden Town, England. A miners' electric lamp comprising a diffusion device, a lamp and a circuit short-circuiting the lamp so as to render the latter useless when the said diffusion device is in action.

749,502. APPARATUS FOR HEATING AIR FOR SUPPLYING BLAST-FURNACES.—George Teichgraeber, Marchienne au Pont, Belgium. An apparatus for heating the air for supplying blast-furnaces, the combination of a plurality of regenerator-flues, a dome placed above said flues, a gas-passage, a plurality of gas-inlet passages leading from said gas-passage into said dome, an air-passage, a plurality of air-inlet passages leading from said air-passage into said dome, said gas and air inlet passages being located in the same plane, an inlet for cold air beneath said regenerator-flues and an outlet for said air after it has been heated by said flues.

749,561. HINGE FOR MINE-DOORS. Thompson Jeffrey, Pittsburg, Ky. The combination with a door for mine-galleries, of a pair of hinges each comprising a yoke to straddle the door, and an eye member projecting beyond the yoke, the upper member being provided with a single eye and the lower member with a pair of eyes.

749,574. PULVERIZER.—Mary W. McAuley, Lansing, Mich., administratrix of John G. McAuley, deceased. In a pulverizer, a sectional cylindrical casing made up of separable flanged sections comprising a receiving-end section, an exhaust-end section, and a series of intermediate sections with internally-corrugated rims divided by centrally-apertured partitions to form a plurality of beater-chambers in each intermediate section; beaters mounted on a central shaft and turning in said chambers and an exhaust-fan driven by the same shaft in the exhaust-end section.

749,630. ORE-GRINDER. — William G. Phipps, Stockton, Cal. In an ore-grinder, a plate in the form of a circle, or a part of a circle, radial cutting edges extending inward toward the center of the plate, said plate being hollowed out or dished between the cutting edges, said cavity commencing at a point a slight distance inward from the periphery and gradually deepening toward the center, each of the cutters being beveled from a point about midway of their length to their inner ends, an annular beveled surface formed upon the back outer edge of the plate, the periphery of the plate being formed with a sharp edge by reason of the annular beveled surface on the back of the plate.

749,679. ROLLS FOR USE IN THE PRODUCTION OF SHEET-METAL STRIPS.—Godfrey B. Johnson, London, England. A pair of rolls for shaping the cross-section of sheet-metal strips, consisting in the combination with a pair of shafts rotated at the same angular velocity, of independent annular sections carried thereby and constituting the operative surfaces of the rolls.

749,700. PROCESS OF LIXIVIATING ORES.—Paul Naef, New York, N. Y. A method of lixiviating ores and other pulverent materials, which consists in passing the ore downward in thinly-divided layers in a zigzag course through an ascending stream of leaching solution, whereby the ore and the solution passing in a serpentine course in opposite directions produces a prolonged and intimate contact of the ore and solution.

749,706. CONCENTRATOR. — Daniel M. Storey, Weeping Water, Neb. A concentrator, comprising a box having a rocking motion and provided with transversely-extended V-shaped riffles, means for operating the box, settling-tanks arranged at the sides of the box and adapted to be filled with water to the level of the water in the box, a conveyer for conveying the concentrates from the bottoms of the forward riffles to one of the settling-tanks, a conveyer for conveying the concentrates from the bottoms of the rear riffles to the other settling-tank, and means for operating the conveyers from the box-operating means.

749,707. STONE-SAWING MACHINE.—Charles A. Thomson, Belleville, N. J., assignor to the Stone-Working Machine Company, New York, N. Y. In a sawing-machine, the combination with a saw-frame, of a supporting-arm pivoted at one end thereto and at the other end having a cross-head, an adjustable stationary beam providing an impact surface for said head to lie against, and a stationary spring mounted on said beam and holding said head seated.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy:

Week Ending December 19, 1903.

28,077 of 1902. CYANIDE MAKING.—C. F. Cross, London, and J. Young, Glasgow. A process for making cyanides, oxalates and ammonia by heating nitrate of soda with alkali and waste organic matter.

1,785 of 1903. MINERS' LAMP.—A. Wiedenfeld, Bochum, Germany. Improvements in ignition device for miners' safety lamps.

6,724 of 1903. LEACHING VAT.—Broken Hill Proprietary Company, Melbourne, Australia. A specially devised vat for the Delprat process for separating sulphides from gangue by means of sulphate of soda bath.

12,377 of 1903. SODIUM SEPARATION BY ELECTROLYSIS.—E. A. Ashcroft, West Point. Improved cell for the electrolysis of fused sodium chloride with fused lead cathodes for making metallic sodium.

17,944 of 1903. SULPHUR BURNER.—H. Blumenberg, Daggett, California, U. S. A. Improved arrangement of air inlets to sulphur burners, with the object of reducing the amount of sublimation.

Week Ending December 28, 1903.

25,582 of 1902. MINERS' LAMP.—W. Patterson and H. M. Darrah, Manchester. Improvements in details of the inventors' miners' lamp, ignited electrically and locked by magnets.

25,954 of 1902. MAKING ALLOYS.—Schukert & Company, Nuremburg, Germany. Obtaining alloys, such as ferrochrome or ferromanganese, used in steel making, almost free from carbon, by passing the metal through a highly heated oxide of the same, and so removing the carbon.

27,597 of 1902. NEUTRALIZING TITANIUM SALTS.—C. Dreher, Frieburg, Baden, Germany. A method of neutralizing titanium salts, without precipitating the titanic acid, so as to render these salts suitable for tanning.

1,416 of 1903. MINERS' ELECTRIC LAMP.—H. G. Prested, London. Improvements in the inventor's miners' electric lamp, for detecting the presence of combustible gas in the atmosphere.

1,835 of 1903. RECOVERING TITANIC ACID.—C. Dreher, Frieburg, Baden, Germany. Improved method of precipitating titanic acid from solutions containing also iron and alumina, in order to obtain a pure precipitate in one operation.

1,883 of 1903. COAL CUTTER.—A. E. Millward, Accrington. A coal cutter consisting of an arm mounted adjustably on a vertical support, carrying at its outer end two cutters driven by bevel pinions, the object being that the cutters may be fed up as far as possible without there being any obstructing working parts.

5,483 of 1903. DRYING ORE.—F. Baum, Herne, Germany. Improved method of extracting water from coal or ore while in transit on a conveyor.

17,368 of 1903. AMALGAMATING PAN.—C. C. Van de Valk, Haag, Holland. A mechanically operated amalgamating pan for the use of prospectors in testing gravel deposits.

19,182 of 1903. SAFETY BRAKE FOR HOISTING ENGINES.—J. J. Jones, Cardiff. Additional brakes independent of the engine for preventing overwinding in mines.

19,504 of 1903. ALUMINUM ALLOY.—Count de Montby, L. Frezel and V. Coppee, Paris, France. An aluminum alloy suitable for brazing and soldering, made by adding ferrosilicon, cobalt and silver to aluminum.

19,933 of 1903. DRYING BLAST.—J. Gayley, New York, U. S. A. Improvements in the inventor's apparatus for extracting moisture from air used in metallurgical furnaces.

22,162 of 1903. ROASTING FURNACE.—G. O. Petersson, Dalsbruck, Finland. An improved furnace for roasting finely crushed ores, burning limestone, etc.

22,957 of 1903. COAL CUTTER.—H. V. Neukirch, Zwickau, Germany. Improvements in the inventor's coal cutter, which cuts grooves simultaneously at the top and bottom of the coal to be won.

TO ENGINEERS VISITING NEW YORK.

A room for the exclusive use of visiting mining engineers is maintained at the New York office of the ENGINEERING AND MINING JOURNAL. Visitors to the metropolis are cordially invited to take advantage of the facilities it offers, by having their mail addressed in care of the JOURNAL and making this office their headquarters. The managers of the branch offices will also be glad to welcome visiting engineers and to be of any service to them that they can.

TO ENGINEERS VISITING LONDON.

We are informed that the Institution of Mining and Metallurgy offers to all members of the American Institute of Mining Engineers nonresident in Great Britain, the privilege of free use of the Institution offices and library in Salisbury House, London Wall, E. C. Visiting engineers may have their letters addressed to the offices of the Institution, and thus enjoy the advantages of temporary office accommodation in the city of London.

PERSONAL.

Mining and metallurgical engineers are invited to keep the Engineering and Mining Journal informed of their movements and appointments.

Mr. C. R. Enock is now at Huaraz, in Peru,

Mr. Geo. J. Bancroft, of Denver, is in New York.

Mr. H. C. Hoover reaches New York on January 23.

Mr. Auguste Mathez, of Denver, has arrived in New York.

Mr. F. C. Roberts has arrived in London from Rhodesia.

Mr. A. C. Beatty has left New York on a short visit to St. Louis.

Mr. M. S. Duffield is at Nashville, Tenn., and will remain there a week longer.

Mr. Noble C. Banks, of Pittsburg, has returned from Bisbee and San Francisco.

Mr. Hiram Donkin has resigned the presidency of the Cape Breton Silicate Co.

Mr. Dwight Huntley is leaving Rhodesia for California in the early part of this year.

Mr. G. F. Beardsley, formerly at Mt. Lyell, Tasmania, has arrived at San Francisco.

Mr. Richard Sykes, of Denver, was in New York recently and left for home on January 20.

Mr. Robert C. Gemmell has been in New York and is now on his way back to Zacatecas, Mexico.

Mr. Frank H. Moss, manager of the Kalgurli mine, at Kalgoorlie, W. A., is on a visit to London.

Mr. H. H. Armstead, Mr. Louis Dunham and Mr. Ernest A. Wiltsee are at the Waldorf-Astoria hotel.

Mr. L. D. Ricketts, consulting engineer to Phelps, Dodge & Co., is visiting New York, from Bisbee, Arizona.

Mr. J. M. Turnbull, coal engineer to the Canadian Pacific Railway, is investigating Pennsylvania practice.

Mr. N. C. Bergman, of New York, has been in Mexico in the interest of a mining company which he represents.

Mr. J. W. Astley, manager of the Snowshoe mine, at Phoenix, B. C., sailed for London by the *Teutonic* on January 20.

Mr. Parley L. Williams, Jr., has been promoted from assistant to superintendent of the Utah Consolidated mine, of Utah.

Mr. John B. Hobson, manager of the Consolidated Caribou Hydraulic Mining Co., at Bullion, B. C., has been at Toronto.

Mr. Martin J. Heller, manager for Mr. J. R. De Lamar, is now in Wyoming after a protracted stay in New York and Cuba.

Mr. J. R. Robinson, president of the Robinson Machine Co., of Monongahela, Pa., is visiting coal mines in Illinois and Indiana.

Mr. C. L. Morris has been advanced from assistant to superintendent of the Utah Consolidated smelter, near Salt Lake City, Utah.

Mr. A. J. Sharpe has been appointed superintendent of the San Ignacio Mining Co., with properties in the State of Mexico, Mexico.

Mr. W. A. Kelly, formerly at the Camp Bird mine, Colo., is now metallurgist to the Hidden Fortune Mining Co., at Lead, South Dakota.

Mr. Robert Coleman, of the Lluvia de Oro mine, Chihuahua, is in New York City, and is to spend a month on the west coast of Mexico.

Dr. R. W. Raymond has been compelled, by illness, to remain at home for the past two weeks, but he is, we are glad to say, much better.

Mr. Ellis C. Spoker, expert in cement plants, has become associated with the Engineering Co. of America, with headquarters at its Chicago office.

Mr. D. P. Rohlfing, of Salt Lake City, recently assumed the general management of the lead mines of the Gold Hunter Co., in the Cœur d'Alenes.

Mr. Fred. G. Farish, of Denver, Colo., who recently returned from La Cananea, Sonora, Mex., has been examining mines near Telluride, Colorado.

Mr. E. K. Hum, of Pittsburg, Pa., has been appointed general manager of the North American Copper Co., operating at Grand Encampment, Wyoming.

Mr. A. J. Beaudette, territorial mining engineer of the Yukon Territory, has been in California, investigating methods of hydraulicking and water supply.

Mr. Frank L. Coventry, of Iron Mountain, Mich., has resigned the superintendency of the mines of the Republic Iron & Steel Co., on the Menominee range.

Mr. W. John Williams, mine superintendent of the Granby mine, in the Boundary district, British Columbia, has been visiting the copper country in Michigan.

Mr. H. M. Deavitt, analytical and consulting chemist and assayer, in Chicago, has taken the management of the Chicago office of the Engineering Co. of America.

Mr. Fred W. B. Johnson, formerly engineer for the Olympus Mining Co., in Alaska, has resigned, and will take charge of a cyanide plant for a Washington company.

Mr. F. W. Page, manager of the United Mexican Mining & Smelting Co., of Mascota, Jalisco, Mex., has gone to Chicago, Ill., for machinery for a smelting plant.

Mr. Fred A. Earls, of Salt Lake City, has been appointed general western agent of the Dearborn Drug & Chemical Co., of Chicago, with headquarters at Denver.

Mr. J. W. Craig, who has been assistant to Mr. F. C. Roberts for the past year, has been appointed consulting engineer to the Forbes Rhodesia Group of Companies, at Bulawayo.

Mr. A. L. Dean, former superintendent of the Canadian Smelting Works, at Trail, B. C., has gone to Tasmania, where he will hold a position with the Mount Lyell Mining Company.

Mr. Thomas F. M. Fitzgerald, lately superintendent of the Portland Gold Mining Co., at Cripple Creek, Colo., is now superintendent of the Federal Lead Co., at Flat River, Missouri.

Mr. David H. Lawrence has resigned as superintendent of the Gothic, Mining, Milling & Coal Co., to take the same position with the Masontown Mining Co., at Frisco, Colorado.

Mr. A. J. Eveland, a graduate student in geology and mineralogy of Johns Hopkins University, has been appointed geologist to the United States mining bureau in the Philippine Islands.

Mr. A. H. Stow, on January 1, assumed charge of the engineering of the six Elkhorn plants of Mr. James E. Jones at Switchback, W. Va. Mr. Stow will also continue his Williamson office.

Mr. John Pengilly, for many years manager of the Chandler mine, Vermilion range, Michigan, and also of the Soudan hard ore mines, same range, has resigned on account of poor health.

Mr. E. H. Garthwaite, consulting engineer to the British South African Co., has returned to Bulawayo from Capetown, much improved in health. He expects to leave for England in April next.

Mr. J. M. McClave, electro-metallurgist of the Colorado Zinc Co., of Denver, returned there a few days ago after a three months' visit in London, where he erected Blake electrical separators, for making tests of ores.

Mr. R. M. Atwater, Jr., has relinquished the resident management of the Ymir Gold Mines, Ltd., and will make Helena, Mont., his headquarters in the future. The former superintendent, Mr. G. H. Barnhart, has been appointed resident general manager.

Mr. Benj. T. Lenzarder secretary and assistant treasurer of the Power & Mining Machinery Co., with works located at Cudahy, Wis., has been in New York, conferring with the other officers of the company. They have decided to extend their plant considerably.

Messrs. Chas. E. Emerick, and Holt Spelman, formerly connected with the Abendroth & Root Manufacturing Co., at its New York City headquarters, are now identified with A. J Hemphill, Inc., 52 Dey street, New York, the well-known manufacturers and dealers in mining supplies.

A dinner to a number of mining engineers from Columbia, South America, was given on January 13 at the Café des Beaux Arts, New York City, by A. J. Hemphill. Among those present were: Messrs. J. S. Johnston, Oliver O. Pike, Isidor Davidov, W. Davidov, R. E. Hazard, Chas. E. Emerick, and Hoyt Spelman.

OBITUARY.

David J. Duncan, a mining engineer, died of pneumonia on January 13, at Quijano, Mexico. Mr. Duncan was 44 years old, and was formerly a resident of Flushing, N. Y., but had been in the West for 20 years. At the time of his death he was vice-president and general manager of the Hays Consolidated Mining, Milling & Lumber Co., of Washington, D. C., and Quijano, Mex. He leaves a widow, but no children.

Edward K. Landis, widely known as a consulting chemist, shot his wife and then himself at his residence in Philadelphia on January 15. Mr. Landis had been in poor health for a year and was undoubtedly mentally deranged at the time of his death. Mr. Landis was once in the employ of the Pottstown Iron Co., but removed to Philadelphia 15 years ago and established a lucrative business as an analytical chemist. He leaves two children.

SOCIETY AND TECHNICAL SCHOOLS.

ENGINEERS' CLUB OF PHILADELPHIA.—At the meeting on January 2 there were 80 members and visitors present. President E. F. Smith announced that J. T. Loomis had been appointed a director to succeed Mr. D. C. Hegarty, who had moved to New York.

Prof. Edgar Marburg, in a discussion on concrete, gave the working stresses for compression and tension, the modulus of elasticity, the strength of adhesion to imbedded steel, the co-efficient of expansion, etc.

Mr. Charles M. Mills gave results of some tests of mortars made from standard quartz sand and sand containing different proportions of loam. Some slides on the Market street subway of the Philadelphia Rapid Transit Co. were explained.

Mr. Henry H. Quimby presented some views of concrete work, bridge abutments and arches built in Philadelphia, and explained them in detail.

A short communicated discussion from Mr. Geo. S. Webster gave some figures showing that a greater quantity of ingredients may be incorporated in a given section, when the concrete is made with a large percentage of water, than when it is made with a small percentage. The wet mixture results in a more compact wall and gives also a smoother surface.

INDUSTRIAL.

The Link-Belt Machinery Co., Chicago, has recently completed the erection of a structural iron shop and additions to tool equipment throughout its plant.

The Redfield Drill Co., of Denver, Colo., recently shipped three of its hand-power rock drills to Keller, Wash.; one each to Burke, Ida., and Black Hawk, Colorado.

The F. M. Davis Iron Works, builders of mining and milling machinery, Denver, Colo., expects to install a new electric power plant at its works during 1904 at an approximate outlay of $25,000.

A Davis Calyx drill, sold by the Rand Drill Co., New York, is being used by the Springfield-Nevada Mining Co. at Olinghouse, Nev., and it is reported 50 ft. in depth was made in a run of three days.

The C. O. Bartlett & Snow Co., of Cleveland, O., has lately received an order from the Dakota Pressed Brick Co., Deadwood, S. D., for a rotary dryer for drying 50 tons of sand a day, also conveying machinery.

The Stilwell-Bierce & Smith-Vaile Co., of Dayton, O., which has been doing a large business in pumps and other hydraulic machinery, has been adjudged in involuntary insolvency. The firm found itself unable to obtain ready money, though having many orders in hand.

A. B. Cockerill, recently connected with the Prime Western Spelter Co., is to build a large smelting plant at Altoona, Kan. The plant will consist of from three to five blocks of furnaces and employ about 200 men. Work has already begun on the construction of the smelter, which will probably be completed by May 1.

The Kilbourne & Jacobs Manufacturingg Co., Columbus, O., manufacturers of wheelbarrows, contractors' machinery, road scrapers, etc., has completed improvements and enlargements to its plant under way for the past two years, which will practically double the capacity. An increase in capitalization of $250,000 in the past two years has been made.

The Colorado Iron Works, Denver, Colo., manufacturers of smelting and mining machinery, report the business of 1902 about $150,000 in excess of that of 1903, the average for the two years being about $850,000. The company expended $20,000 during 1903, for traveling cranes, for the machine shop, which have a travel of 130 ft. and a capacity of 15 tons.

The Sao Paulo Tramway, Light & Power Co., operating a large power and lighting system in Sao Paulo, Brazil, is said to be preparing to extend its plant to the Tiete river. The equipment is of American build, the generators being of General Electric manufacture, while the Stilwell-Bierce & Smith-Vaile Co., of Dayton, O., secured the contract for the turbines. William Mackenzie, of Toronto, is president of the company, and F. S. Pearson, of New York, is consulting engineer.

The Gibbs Engineering & Manufacturing Co. invited a number of mining men, representatives of trade papers and of the daily press to visit its works at Glendale, N. Y., on January 14. The visitors inspected the plant and saw a test of motor wagon and two trailers just finished by the company. The trailers each have an electric motor driven by a gasoline engine on the motor car. Considering the almost impossible conditions the test was satisfactory. Luncheon was served for the visitors, some of whom told of the work for which the Gibbs motor wagons were to be used.

The Brooks plant of the American Locomotive Co., Dunkirk, N. Y., is completing a number of improvements, including the installation of a compound, direct-connected Brown-Corliss engine of 800 h. p. and a 500-kw. General Electric generator. A number of new motors will be installed at once, greatly increasing the shop capacity. A new wheel shop, 120 by 225 ft., is nearing completion, the equipment including a number of electric travelling cranes, a 101-in. driving wheel and a new quartering machine. The floors are of tar concrete. All departments of the works are running full and orders for many months ahead are reported.

TRADE CATALOGUES.

The Allentown Rolling Mills, of Allentown, Pa., has issued a series of booklets containing from four to eight pages, in which are described a number of different types of electric pumps built by the company. Each of the booklets contains a description of the particular type of pump illustrated on the front cover page, in addition to the details of construction, stability, application and a table to aid in selecting the size pump necessary to handle a given amount of water at various depths.

Holman Bros., Cambourne, Cornwall, England, engineers and iron founders, have published an illustrated catalogue and price-list of rock-drills, compressors, pumps and other engineering machinery, in what they state to be an abridged form, but which contains a vast amount of information, and illustrations in proportion, of the machinery which they are supplying. The company maintains offices at Glasgow, Paris, Coolgardie, Victoria, B. C., Johannesburg and Mexico. The London office is Broad street, E. C.

SPECIAL CORRESPONDENCE.

Denver. Jan. 16.

At Telluride, union miners, mostly Italians, accused of threatening non-union miners, continue to be deported by the military. The large mines are again operating, either with full or slightly reduced forces, while the smaller properties are running with full complements of men and the mineral output of the district is attaining normal proportions. While the military force is being steadily reduced, a local military company has been organized largely composed of cowboys, so that if disturbances break out after the departure of the Colorado National Guard, the authorities can utilize the local company to effectually deal with any of the remaining union miners who attempt to make trouble.

At Georgetown the past week witnessed the arguments of counsel in the trial of the 13 union miners charged with complicity in the dynamiting at the Sun & Moon mine in July last. The jury, after being out for nearly two days, has brought in a verdict of not guilty, a remarkable verdict considering the evidence introduced by the prosecution.

During the past week a number of important mineral strikes have been reported at Cripple Creek, Georgetown, Ouray and other points.

San Francisco. Jan. 13.

(From Our Special Correspondent.)

Miners are beginning to complain of lack of rain, the winter thus far in California having been rather dry. In the mountain regions of the upper part of the State there has been thus far very little snow, and that has melted. This is not a good augury for mining next summer. Already the water companies and electric power companies are beginning to fear a shortage of water.

The litigation connected with the Royal Consolidated Mines, Ltd., at Hodson Calaveras county has been settled by compromise. J. H. Brotherton, the plaintiff, and J. C. Kemp Van Ee, now manager of the mine, were for some years promoters in London. When the Royal mine was sold for $400,000 in 1898 Brotherton claimed a quarter interest and Van Ee denied this, saying he had acquired the property after dissolving with Brotherton. At any rate the case has been compromised without coming to trial. The mine is now worth some millions and has one of the largest and best milling plants in the State.

The case of this mine against the striking miners came up in the United States District Court in San Francisco on January 11. The miners were summoned to show cause why the temporary injunction should not become permanent. Affidavits read for either side contradicted each other in every particular. The miners denied any violence, intimidation or any other overt acts, and even denied having intimidated non-union men seeking work, though it is notorious that men arriving at Milton were kept from going to the mine, and were threatened if they accepted employment. The case was continued.

The estimates of the superintendent of the United States Mint at San Francisco and of the director of the Mint for the gold product of California for last year show a material falling off. The silver is proportionately less also. The local newspapers all find fault with these estimates, and according to usual custom make guesses of some two million dollars more, although the superintendent of the Mint has sources of information not available to the newspapers generally. The percentage of reduction of receipts for the year is the same at the Selby Smelting Co. as it is at the United States Mint, and the Selby company receives more original gold dust and bars than the Mint, though it all comes to the Mint finally. The drought during the fall months and the strikes during the year easily account for the falling off. The affairs of the Plumas Gold Mining Co. at Greenville, Plumas county have reached a climax from the default in payment of some $6,000 due the owners, Standart & McGill, after $13,000 had been paid. Machinery and other personal property has been attached by local creditors who have large claims. This is the enterprise launched by W. D. Lawton, formerly of Sacramento and sometimes called the Lawton mine. Last season the company spent some $65,000 in erecting a mill plant and other improvements. It is stated that under the terms of the option the improvements go with the mine back to the owners, who now have possession.

The southern California water companies are in rather an awkward position from the recent Supreme Court decision that "the water belongs to the soil," and cannot be pumped from wells and taken elsewhere for sale to the damage of lands adjacent to the source. Many pumping companies will probably be unable to care for the lands depending upon them for water. It is now suggested that the issue be brought before the United States courts. The question is a very serious one for the southern part of the State.

Sales of dredging ground continue in the Yuba river section near Marysville, the latest being an old farm to eastern people, at $150 per acre. Many years ago it was a flourishing farm, but debris from hydraulic mines covered it from 10 to 20 ft. deep.

It is reported that the Pacific Transportation Co. contemplates building a pipe line from Sunset district in the San Joaquin valley to Antioch to bring the Sunset oil to tidewater. The oil from this district is lighter than that from the Kern river field, and may be more easily pumped in consequence. The Kern oil flows through a pipe line with difficulty, particularly in cold weather.

Southern California oil producers are not at all pleased with the idea of the Standard Oil Co. trying to sell Kern river oil in Los Angeles, but no cut has been made in prices as yet. Los Angeles men, however, feel that there is a club over their heads, as Kern river oil can be sold in Los Angeles at a profit at 75c. per bbl., and the Standard company has 4,000,000 bbl. stored on hand for sale.

Toronto. Jan. 15.

(From Our Special Correspondent.)

G. A. Overstrom, of Chicago, recently passed through Toronto from Craigmont, Renfrew county, Ont., where he has been supervising the erection of the new mill of the Canada Corundum Co. He said that this mill will soon be in operation and that its daily output of grain corundum will be worth between $2,000 and $3,000. It is larger than any ore-concentrating mill in Canada. The company employed about 250 men during the open season.

W. H. Aldrich, of Trail, B. C., chief of the mining and metallurgical department of the Canadian Pacific Railway, was at Montreal recently to confer with Sir Thomas Shaughnessy, president of the company. He stated that the semi-anthracite coal mine near Banff will be worked to produce about 15,000 tons monthly at the outset. The company is preparing to erect a breaker.

The Canadian Department of the Interior has just issued a hand-book on the location and examination of magnetic ore deposits by magneto-metric measurements, by Dr. Eugene Haanel, superintendent of mines.

Louis Simpson, of Ottawa, who has for some years made a study of thermo-electric processes of smelting iron ore, in addressing the Ottawa Board of Trade on the subject, urged that the cost of ore from the Ottawa valley and adjoining districts laid down at Ottawa would be one-third the cost of iron ore at Pittsburg.

B. Folger, of New York, and T. R. Jones, superintendent of the A. L. 282 gold mine, west of Port Arthur, were in Toronto recently. The company has ordered machinery for a 10-stamp

mill and is applying to the Ontario Government for aid to construct a railroad from the Canadian Northern line to the mine, a distance of about eight miles.

W. Wiley, of Port Arthur, has obtained from the Bureau of Mines the use of a diamond drill for exploring iron properties on Black Sturgeon lake south of Lake Nipegon. He reports that the West End silver mine will resume work. Explorations on the iron prospect west of White Fish lake along the Port Arthur, Duluth & Western railway will shortly be started by F. Hille, of Port Arthur.

Iron manufacturers are strongly urging the Dominion Government for a revision of the tariff. J. H. Plummer, president of the Dominion Iron & Steel Co.; F. P. Jones and William McMaster, manager of the Montreal rolling mills, recently interviewed the finance minister. They asserted that steel billets, steel rails and other products from the United States were being sold at from 20 to 25% less than the prices in the American home market. American steel billets, they claim, are being offered as low as $20 per ton, whereas a year ago Canadian manufacturers were getting from $24 to $26 per ton for pig iron.

Victoria. Jan. 12.

(From Our Special Correspondent.)

The directors of the Princess Royal Gold & Copper Mining Co. have decided to resume development at the copper mine on Princess Royal Island.

Boundary.—The judge of the County Court at Phoenix has ordered the Winnipeg mine sold on January 28 to satisfy bank and other judgments. The final payment of $8,000 has been made on the Jack Pot in Wellington camp. The Hall mines smelter has secured control of the output of the Oro Denoro in Summit camp, and shipments are to be maintained at the rate of 150 tons daily. Rich ore has been struck on the Elkhorn and Don Pedro properties, near Greenwood. It is reported that 18 in. of exceptionally rich ore have been found in the 210-ft. level of the Waterloo at Camp McKinney.

Coast.—A promising new ore-body is reported in the Lenora mine, at Mount Sicker. The ore body, which carries high copper values, has been penetrated 9 ft. The Canadian Pacific Railroad has granted an exceptionally low freight rate on ores shipped in carload lots from White Horse to the Ladysmith smelter.

East Kootenay District.—Despite the miners' strike early in the year, the Crow's Nest Pass Coal Co. increased its output from 442,049 tons of coal and 121,000 tons of coke in 1902 to 650,000 tons of coal and 166,000 tons of coke in 1903, the collieries being, Coal Creek, 240,000 tons; Michel, 262,000 tons, and Morrisey, 150,000 tons, while at Fernie, 96,000 tons of coke were manufactured and at Michel 70,000 tons. During the year about $1,000,000 was spent in improvements and development. At Coal Creek three new mines have been opened, and a tramway and other plant installed, while in addition three high pressure Mumford boilers are now being put in. At Michel two new mines became productive in 1903, and a third has been prospected. A ventilating fan having a capacity of 200,000 cu. ft. per minute was installed at Nos. 8 and 9 mines, and 252 coke ovens have been added, there being now 464 ovens at this colliery. At Morrissey four mines have been productive and two are in course of development. Here new slack storage bins having a combined holding capacity of 6,000 tons were built, a waterworks system, and an endless rope haulage system established, 140 coke ovens were built, while 100 others were under construction. The outlook for a large increase in the East Kootenay coal trade in 1904 is most promising.

Lardeau.—The two principal productive mines, the Silver Cup and Nettie L., shipped in 1903 2,018,857 tons, valued at $139,891. The superintendent of the Eva mine at Camborne states that the December clean-up realized $10,400 in gold, and about $600 in concentrates. The Golden West and Crown King are reported sold for $25,000 and the Spy-glass at Poplar Creek for $50,000. A few tons of ore from the Lucky Jack and Swede group, Poplar Creek claims, have been crushed for test purposes at the Oyster-Criterion mill, the return being given $250 per ton, and $37 per ton respectively, but as so many exaggerated reports about these properties have been published, authentication is necessary. The reported strike on the Oyster-Criterion is, according to a director, quite without foundation.

San Luis Potosi. Jan. 14.

(From Our Special Correspondent.)

In Nuevo Leon, the Cinco de Mayo has resumed operations on Mitre mountain, under the order of William Schoelmann, and rich silver ore is reported encountered. The San Salvador y Anexas, of Lic. Emeterio de la Garza, Jr., is showing up splendidly, but no shipments will be made until the aerial tramway is completed. It is said that Edward Doerr has been examining this property for the Guggenheim Exploration Co. The Monterey Iron & Steel Co. is endeavoring to have the Federal Government place a high protective tariff on all foreign steel coming into Mexico.

In the northern end of Lower California, three new concerns, the Aurora Consolidated Mining Co., the Viznaga Gold Mining Co., and the Texas Mining & Milling Co., work the mines at Triunfo, employing about 1,000 men, and the Progreso, 800, while a short distance south of Triunfo is the Esperanza mine. Seventy-five miles south of Ensenada are large sulphur deposits, practically on the Gulf coast, near the Colorado. Salt is coming from a number of the islands, though the Carmen is becoming the most important.

In Chihuahua the Capuzaya Mining Co., organized in Washington, D. C., by Senator J. P. Jones and others, with a capital of $5,000,000, is to operate the San Vincente and San Baltazar properties in the Parral district. E. A. Horner has organized the Mexican Gold Fields Co. to work on the placers of Conchos river, near Santo Domingo. The old smelters of El Portrero, at Urique, which were destroyed by floods in 1895, are being restored by Dr. Becerra. The Sahuayacan Mining Co., at Rayon, 40 miles west of El Campo and 140 from Minaca, has finished a 20-stamp mill. The Lluvia de Oro, under the direction of Mr. Robert J. Coleman, has ordered machinery for a 20-stamp mill to take the place of the old one. The company is said to have a 45-ft. vein of $35 ore, and is seeking a concession for a railroad to connect with the Kansas City, Mexico & Orient Railroad at San Andres del Rio.

The Americano mine, of Terrazas, recently purchased by the Torreon smelter people, is to the front again with a strike of high-grade copper ore.

London. Jan. 19.

(From Our Special Correspondent.)

The progress of negotiations for the introduction of Chinese, or other foreign, labor into South Africa is followed with great interest here, and the publication this week of a draft of the ordinance by the Transvaal Government has naturally attracted special attention. The ordinance deals with the introduction of non-European unskilled laborers, except natives of the African continent south of the twelfth degree of latitude, and the importation is restricted to the Witwatersrand gold-mining district, but it does not interfere in any way with the employment of British Indians on the railways. The responsibilities of the contractors who introduce these foreign laborers are fixed very exactly, and the terms and penalties are stringent. The imported laborer is not allowed to own any property, or to have any other occupation than gold mining, nor is he even allowed to go further than a mile from his place of work. His only alternative to labor in the mines is to go back to his home. Though no special class of laborer is mentioned, yet it is obvious that the Chinese coolie is practically the subject of this ordinance. In unprejudiced circles in England, where self-interest does not confound the judgment, it is felt that the Chinese coolie may have insuperable objections to these stringent terms and conditions. It is true that he goes to other countries than his own as a miner, but that occupation is usually looked on as only a stepping-stone to better things; besides, which he is comparatively free to move about at will and to change his master and occupation. Altogether, the Transvaal mine-owners have a difficult problem before them, and the labor trouble is still far from settlement.

The shareholders of the Velvet Rossland Mine, Ltd., and the Portland Rossland Mine, Ltd., owning the two adjoining properties of those names, on Sophie mountain, Rossland, B. C., have decided to amalgamate, and to treat the two properties as one, which, to all intents and purposes, they are. The two companies were floated by the same firm, the New Gold-Fields of British Columbia, Ltd., and neither has been successful so far, owing to the fact that the deposits are patchy and of low grade. In the present scheme for amalgamation, the nominal capital of both companies is being drastically reduced, but which the Portland shareholders get fully-paid shares in the new company. The Velvet shareholders will have to submit to a liability of 2s. 6d. per £1 share. The Portland shareholders are, therefore, on Velvet in more senses than one. The fact is, that a majority of the Portland shares are held by people who refuse to confirm the deal on any other terms, while, as the Velvet vein runs into the Portland property, the Velvet Co. must acquire the Portland or practically cease to exist. The Velvet has always been in difficulties, and during the past few months it was found best to abandon the lower workings, letting them fill with water, and to confine attention to the first and second levels. With the extra capital now to be provided by the Velvet shareholders, it is intended to erect a smelter on the "direct" system, and it is also announced that the Government is to build a road from Rossland. With these economies it is anticipated that the ore will be worked at a profit. Mr. William Thompson, of the Rossland Kootenay Co., has very fully examined the mine and the nature of the ore, and he is hopeful that it will pay under the altered conditions.

Melbourne. Dec. 5.

(From Our Special Correspondent.)

Mr. H. C. Hoover, of Messrs. Bewick, Moreing & Co., has arrived here to size up the investigations conducted by Mr. Waldemar Lindgren and the company's representative, Mr. Mitchell, of the possibilities of Victorian deep-lead mining. Mr. Hoover is credited with having £400,000 at his command to invest in the industry. Without wishing, in any way, to decry his enterprise, I would say that it is well he has a good financial equipment. The properties he is mainly interested in are the Loddon Goldfields, the Moolort Goldfields (two of the Whitaker Wright-London & Globe flotations), and the Victorian Deep Leads—West Australian Goldfields venture. The interest acquired by Messrs. Bewick Moreing & Co. and their friends in these properties, so far as the facts have come out, were obtained for a mere song, though the capital sung on them aggregates pretty well £250,000. The Loddon Goldfields and the Moolort Goldfields are large claims on the lower reaches of the Berry lead, and they each have reached the pumping stage; that is, they have sunk their shafts, driven under the lead and bored up into it to bring away the water prior to rising into the wash. The water being pumped at the two mines is about 7,000,000 gallons per 24 hours, but it is intended to raise the efficiency of the plant to 10,000,000 gal. per 24 hours. The Charlotte Plains pumps nearby, but on the Kajorca lead, are lifting 7,000,000 gal. per 24 hours, and the Chalks three pumps another 5,000,000 gal., so that within a radius of seven miles 22,000,000 gal. of water are pumped daily; yet the impression made on the water in the lead is very slight. It is this fact that makes old deep-lead miners shake their heads doubtfully when one talks about a quick issue to Mr. Hoover's venture. Satisfaction is felt that he has gone nearer the source of the lead by buying into the Berry United. This is the next claim save one on the Berry lead, from the Berry Extended, the biggest deep-lead alluvial mine in the State and one of the most consistent dividend-payers. The Berry United lease is some 20 miles distant from the Moolort claims, and the accumulated water between can be better imagined than gauged. However, Mr. Hoover will bring his great gift of organization to play, and will provide what has long been wanted in deep-lead mining—first-class engineer-

ing skill and plenty of capital to properly equip his claims.

The most properous mining camp of the State at the present time is Bendigo; there is every probability that this year's output will be the largest for many years past. This arises from developments on the New Moon line, where companies are paying dividends of 1½ to 3 shillings per share per fortnight. Of course, the great feature of Bendigo mining is the small capitalization; a company of 50,000 shares of £1 each is a *rara avis*. Costs are exceedingly low and dividends could be largely increased if plants were enlarged. But Bendigo people open up their mines slowly on a limited capital, and they do not hasten to beat out the ore-reserves in order to save interest. They scoff at mine-sampling, believing only in the battery test, and they are averse to mechanical aids. Yet their extraction is close and the supervision so keen that waste is almost unknown.

Mr. Curle has left here for Queensland, where he has some very bitter critics. He wants sampling and more details in the balance sheets of mining companies. The Charters Towers people have slang-whanged him because he dwelt on their remissness in these matters. He had the ill-luck to speak pessimistically of the Queen Cross Reef in its early days, and this is the hobby-horse they mount. However, the whole issue is likely to be referred to Mr. T. A. Rickard for an expression of opinion. (See our issue of January 14, where this controversy is discussed.—EDITOR.)

Victoria, since the discovery of gold in 1851, has produced 66,500,970 oz. of gold, of which the Ballarat district is responsible for 19,028,707 oz., and Bendigo for 14,479,426 oz.

Mr. W. Lindgren is leaving Victoria simultaneously with this letter. He has been reporting on the deep-leads of the State for Messrs. Bewick Moreing & Co., and is understood to be favorably impressed with the possibilities of deep-lead mining. F. H. BATHURST.

Perth. Dec. 7.

Kalgoorlie.—The Great Boulder's main shaft is down 1,790 ft. Extensive development work is in progress. On the 1,200 ft. level the best ore in the mine is at present being obtained. The average width of ore is 11 ft. and average value $30 per ton. The branch of the Horseshoe-Boulder-Boundary lode has been proved to be well in Boulder ground, and is worth 5 oz. per ton for a length of 40 ft.

The Associated is extracting very rich ore at the third level. The Ivanhoe's east lode at 1,014 ft. level is 11 ft. wide, value $10 per ton. The mine is opening up well at all points. The Ivanhoe South extended is getting splendid sulpho-telluride ore in the north drive at 1,000 ft. level. The body is 35 ft. wide. The Kalgurli's ore body at the 1,000 ft. level continues to open up well, and is now 35 ft. wide. The Ivanhoe Junction has struck good grade ore 20 ft. wide at 150 ft.

Norseman Fields.—The Princess Royal is looking well. The main shaft is down 496 ft. The lode is 4 ft. wide and of good grade.

Menzies.—The Queensland Menzies has partially stopped work pending the increase in stamps. Meanwhile underground work will continue.

Murchison Field.—This field is being active. Work in and around Cue and Day Dawn is progressing well. The Great Fingall is maintaining its values at all levels. The Rubicon is about to erect a cyanide plant.

The Government is about to erect a smelter at Phillips River fields, to treat ores purchased from various leaseholders.

GENERAL MINING NEWS.

(From Our Special Correspondent.)

MINERS' CONVENTION.—What promises to be the most interesting convention of the United Mine Workers' of America ever held met in Indianapolis on January 18. Over 1,000 accredited delegates representing 26 states were present. These delegates represent approximately 350,000 men and boys, affiliated with the organization. The convention will consider the situation in the bituminous and anthracite districts and the formulation of demands to be made on the operators of the central district, composed of Indiana, Ohio, Illinois and western Pennsylvania, to govern wages and working conditions during the year beginning April 1.

The joint conference with the operators will be held in Indianapolis on January 28, and will continue until an agreement is reached and a contract signed, or until an adjournment is had without an agreement. Matters relating to the 8,000 men on strike in Colorado and Utah, the 500 in the Meyersdale district in Pennsylvania and the 1,000 in West Virginia will especially be considered. The miners received a 14½% increase in wages upon a compromise agreement last year. This year the conditions are materially changed. Industrial conditions are not so good, and the result is that the operators will ask for a decrease in wages of from 15 to 20%. On the other hand, the miners are talking increase, and a stubborn contest is inevitable.

In the miners' convention the paramount issues will be the run-of-mine basis, the machine differentials, child labor, socialism, etc. The delegates report their local unions in good condition. There has been a large increase in membership during the year, and altogether the year has been the most prosperous one to the miners in the history of coal mining in this country.

President Mitchell in his opening address stated that the relations of operators and miners in the anthracite region have grown more cordial since the strike, and with very few exceptions the awards of the Commisison have been rigidly observed. He gave the total membership of the organization as 287,545. He supported the anti-injunction and eight-hour bills now before Congress.

Secretary Wilson said that on November 30 the Union had $1,129,137 on deposit in Indianapolis banks.

ARIZONA.

COCHISE COUNTY.

(From Our Special Correspondent.)

Calumet & Pittsburg Mining Co.—This company, organized from a development company of the same name, has officers and directors, and to a large extent stockholders identical with those of Calumet & Arizona. None of its stock was offered the general public, and no prospectus or other statement, except a circular announcing rights and methods of payment, has been issued. The company's Briggs shaft is down 915 ft., but operations are held at that level by water. Drifts at the 910 ft. level are encouraging. About 1,000 gal. of water are lifted per minute. Prescott compound condensing pumps of an extreme capacity for 4,500 gal. per minute are under construction.

Commonwealth.—Extensive caving at this mine at Pearce, threatening the entire destruction of the workings, has necessitated closing down. The timbers are crushing like pipestems under pressure and great cracks extend to the surface. The complete collapse is only a matter of time, and entirely new workings must be projected and constructed for the future.

GILA COUNTY.

(From an Occasional Correspondent.)

Black Warrier Copper Co. Amalgamated.—Suit for the possession of upwards of 60 unpatented mining claims and for the possession of surface improvements, valued at the cost price of over $300,000, is in preparation for presentation to the District Court of this county. The claims are, or were, the property of the company, organized and promoted about four years ago by James A. Fleming, of Phoenix. It is alleged that the property reverts to the original owners, one of whom is Mr. Fleming, on the assumption that any corporation organized under the laws of Arizona must of necessity hold all meetings of stockholders and directors within the territorial limits to be legal. After four years of expectations and the expenditure of about $400,000, without results, dissensions arose, and the stockholders determined to make a change. At the annual meeting in Philadelphia, on December 9, Charles A. Chase, of Philadelphia, was elected a director instead of Mr. Fleming, and afterwards elected president. When he arrived in Globe to take charge he was met by the announcement that the stockholders had held a meeting in Globe on December 7, and had elected James A. Fleming, president, and his three sons, respectively, vice-president, secretary and treasurer, and in view of that claim Mr. Fleming is holding possession.

The contesting stockholders allege that all the stock books, etc., are in the Philadelphia office and that at least two resident stockholders at Globe got no notice of a meeting to be held December 7, and the Philadelphia meeting was called by the board at a regular meeting held on September 30, at which Mr. Fleming presided.

The properties are a few miles north of Globe and adjoin the Old Dominion group. They are believed to have great value, though very little development work has as yet been done. Much money has been spent on surface improvements. The position assumed by Mr. Fleming has attracted attention from other Arizona companies which hold their meetings in other States, and has resulted in many queries.

CALIFORNIA.

AMADOR COUNTY.

Del Monte Mining Co.—An assessment has been levied to pay off indebtedness and permit of the tunnel being pushed.

Kennedy Mining Co.—At this property, at Jackson, Webb Smith, superintendent, three new boilers are being added, making nine in all, which will give 1,000 h. p. for the hoist. At present 650 h. p. is used. The Allis-Chalmers hoist just completed can hoist from 4,000 ft. At the east shaft mill the last 10 of the 60 stamps are ready.

Whitmore.—The new 10-stamp mill on this mine, near Volcano, is running.

CALAVERAS COUNTY.

The new dredge at Jenny Lind has been started with electricity. F. M. Hammon is local manager.

Ohio.—At this mine, at Douglas, formerly known as the Chase, the owners have been ground-sluicing in order to start drifts into the mine at a point known to be rich and reopening the mine to get at certain rich pillars, which were left.

Wide Awake Mining Co.—A 10-stamp mill has been completed at this mine at Railroad Flat. The property is worked through a 130-ft. shaft, and 200 ft. of drifting has been done, so there is now ore supply for the mill. The concentrates are to be saved.

KERN COUNTY.

Agreement has been reached between the Kern River Co. and the five mining companies recently organized by H. E. Huntington, by which the former company will turn the river from its bed near Kernville to permit the Hawgood, Murray, Kercheoff and Esham companies to work the river bed.

Kinyon.—This mill has been leased by C. H. Snow who has bought an 8 h. p. gasoline engine.

Lida.—This mine is in Antelope valley about four miles from Rosamond. The mill is small but some of the ore has run over $200 per ton. The greatest depth attained is 340 ft. The clean-up from 100 tons in November was $12,400.

Pacific Smelting Co.—Work has begun on an office building at Kern. The following new officers have been elected: A. W. McRae, president; Everett St. Clair, vice-president, and W. T. Ogilvie, secretary.

Yellow Aster Mining & Milling Co.—This company at Randsburg, with offices in Los Angeles, paid a dividend of $10,000 on December 30. The company is now running both mills steadily and expects to increase the monthly dividend. Things are not yet running smoothly as the Western Federation of Miners has not declared the strike off.

MADERA COUNTY.

Jessie Bell.—The owners of this copper mine, near Daulton, are putting in air drills. Development work is being pushed.

California Development Co.—This company, on Grizzly ridge, has made a good strike, the ore showing free gold.

Beekman Hill.—Turney & Co. intend to erect a mill on this mine in the spring.

Brophy.—At this mine in Shady creek good progress is being made in opening the mine. Charles L. Miller is superintendent.

PLACER COUNTY.

Big Boulder.—This claim, in Secret cañon, on the American river, has been purchased by N. J. Pierson, Henry Wales and N. T. Collins.

Holmes Lime Co.—This company, near Colfax, E. K. Hawkins manager, is to build an electrically operated 2,800-ft. tramway.

PLUMAS COUNTY.

Dunn.—This mine, on the North Fork, is sending 15 tons of ore daily to the mill. The vein is found to be permanent and of good width, averaging well.

Glazier.—At this mine, on the North Fork, a tunnel is being run to tap the channel at the lower end. It is now in about 700 ft. and will drain the mine.

Horseshoe.—It is understood that a 10-stamp mill will be put on this mine, on the North Fork.

Regal Gold & Copper Mining Co.—This company, organized to mine at Genessee, has the following directors: H. H. Blood, M. Duval, H. P. Mason, E. D. Knight, of San Francisco, and J. D. Williams, of Cherokee. The place of business is San Francisco. The capital stock is $600,000 in shares of $1 each.

San Jose.—H. F. Kelly & Son are developing this gravel claim on the North Fork, and will have a force of men at work the coming summer.

RIVERSIDE COUNTY.

Copia Mining Co.—A plant is being installed by this company on the Colorado desert to handle 100 tons of ore per day. G. L. A. Richter, of Los Angeles, is superintendent.

Temescal.—A carload of new machinery has arrived for this tin mine, idle for seven years. Los Angeles men are also making experiments on the tailings of the mine.

SAN BERNARDINO COUNTY.

M. F. Doland is working one of the old silver mines at Calico. Good ore is also being taken from the Klondike mine, owned by H. Galeron and W. J. Beaver.

Bartlett Borax Co.—This company, at Borate, is about to start work.

Pacific Borax Co.—This company has 78 men working at Borate.

Paine.—This mine near Barstow has been bonded to Boston men who are planning to develop it on a large scale.

SHASTA COUNTY.

L. M. Lane and S. G. Spence have obtained control of the talc mine near Sims, and intend making talc brick for furnaces which use oil as fuel. They expect the brick to take the place of the magnesite brick or fire-brick used in locomotive furnaces.

Crown Deep.—This mine, near Redding, owned by James Hume and I. J. Cole, and under bond to the Crown Deep Mining Co., has a large force of men at work and is shipping ore to the smelters at Keswick.

Little Nell.—This mine, near the Iron Mountain railroad, is being reopened by the Pittsburg & Mount Shasta Mining Co. Two shifts are developing work, and the mine will shortly begin shipping ore to the smelters.

Mammoth.—The bonding of this group by the Guggenheims, after careful examination, is expected eventually to cause the erection of another copper smelter in the county.

Mountain Copper Co.—This company, at Keswick, Lewis T. Wright manager, is about to install its fifth furnace. The smelter plant is now running full handed. About 26,000 tons of ore are treated monthly.

SIERRA COUNTY.

Alaska.—This old mine at Pike City is to resume operations shortly, and has upon it a 20-stamp mill for which electric power is available.

Bellevue Mining Co.—This company, at Gibsonville, formerly the Thistle shaft, C. B. Wingate manager, is taking out very high-grade gravel, some of it going up as high as $40 a carload.

Wild Boar.—This mine is a continuation of the Bellevue channel, and is securing about $6 per car-load from the gravel in the rim above bedrock. A pump is to be put in to drain the gravel at this point, and a drift run to bottom the channel and work upstream, so as to dispense with the cost of pumping and hoisting.

SISKIYOU COUNTY.

Pacific Mines Co.—This company has made final payment on the Fort Goff placer mines near Seiad. The mine is being worked under J. W. Martin, superintendent.

Portuguese.—This mine, owned by Wood & Cudahy, of Happy camp, has been leased to Fort Jones men for the season.

McKinley.—At this mine on Humbug creek 50 mén are tunneling and building a mill and tramway.

Van Brunt.—This mine, formerly Ah Ock, at Happy camp, is being equipped for the season's run. D. I. Jackson is manager.

Willard.—This mine, at Hamburg Bar, has been leased to Charles and Lawrence Ramus for the season.

STANISLAUS COUNTY.

J. E. Doolittle and others who have bought the La Grange ditch, have been acquiring lands below the ditch and are to use the water power for generating electricity. The gold-bearing lands are to be worked by dredges which will be ready by spring.

TRINITY COUNTY.

Gold Hill.—The bond has been extended six months and more men have been set at work by W. C. Weirk, superintendent.

Brown Bear & Lappin.—Both these quartz mines, at Deadwood, have been closed down for the rest of the winter.

California.—This group, at Trinity Center, has been sold by John H. Boyce to the California Surety Co., of San Francisco.

Fairview.—At this mine, on the divide between Shasta and Trinity counties, the ore has been opened on three different levels, and another drift on the Trinity river level will be opened this year. The mine is equipped with a 10-stamp mill, and 30 more stamps will be added this spring.

TUOLUMNE COUNTY.

Bell.—Ground has been prepared for the new 20-stamp mill at this mine.

Soulsby.—The old vein has been re-discovered at this mine in Soulsbyville. Superintendent Sherwood says it is small but rich.

Two Brothers and Mack.—The tramway between these two mines is finished and will be put in operation at once.

YUBA COUNTY.

Mount Hope.—This old quartz mine, between Woodville House and Forbestown, is to be worked again, and men are at work putting the mill in condition.

COLORADO.

BOULDER COUNTY.

Burlington Boulder Mining & Milling Co.—This company is opening up eight claims near Gold hill. John G. Boundy, of Boulder, is mine superintendent.

Lottie.—H. M. Pratt is in charge of 15 men developing this property at Sunshine. A shaft is down 100 ft. and a hoist is to be installed. High grade gold ore is shipped in sacks.

Standard Gold Reduction Co.—This company has been reorganized, and work resumed on the property at Springdale, 15 miles from Boulder, which is developed by about 1,000 ft. of work. A large steam hoist is to be installed shortly and the ore will be handled by a 5,280-ft. aerial tram installed by the J. H. Montgomery Machinery Co. The 20-stamp mill is equipped with plates and Wilfley tables. J. V. Sybrandt, general manager, has 20 men employed.

Wano.—This new cyanide mill at Jamestown is in operation. It means much to the district if successful. The mine has 40 ft. of $15 ore.

CLEAR CREEK COUNTY.

Helen-Harold.—This tunnel on Wood mountain, near Georgetown, is in about 1,000 ft., and has cut a number of veins. The management may erect a mill in the spring.

Silver-Plume Mines & Tunnel Co.—This company expects to instal machinery shortly on the Marry Etta group on McClellan mountain above Silver Plume.

Stevens.—This 50-ton mill at Silver-Plume is completed and being tested.

EL PASO COUNTY.

Golden Cycle Mining Co.—The projected mill it is announced, will be erected in the spring on the site at Colorado City, at an estimated cost of $300,000. This announcement is due to the success met in prospecting for water, 100,000 gal. daily being obtained from wells.

FREMONT COUNTY.

United States Reduction & Refining Co.—The Union mill of this company at Florence, idle since the Cripple Creek strike opened, was placed in operation January 2 with a full force of 150 non-union men.

GILPIN COUNTY.

(*From Our Special Correspondent.*)

Hampton Consolidated Mines Co.—This new company has capital stock of $600,000. N. C. Hughes, G. I. and Henry Chittenden, Henry J. Ingersoll and H. S. Morgan are the directors, with main office in Denver. The company owns and will operate the Hampton property in Russell district.

Nevadaville Consolidated Gold Mining & Milling Co.—Machinery is arriving for the new concentrating plant being erected at the King property near Nevadaville with a capacity of 100 tons daily. A. W. Rucker, Nevadaville, Colo., is superintendent.

Pozo.—Denver and local men have bonded this property in Nevada gulch and are sinking the 125-ft. shaft at least one lift of 100 ft. They have a good crevice of lead and zinc ores and are making tests. A. W. Rucker, Nevadaville, is manager.

LAKE COUNTY—LEADVILLE.

(*From Our Special Correspondent.*)

Empire Tunnel Co.—This organization has control of the old Cloud City property. Considerable new work is under way.

Fortune.—Work is carried on at the 600 and 1,000-ft. levels, showing both oxidized and sulphide ores. The ore has been followed in places for 100 ft. and cross-cut for 50 ft. while it runs from $4 to $5 a ton gold.

Forest City.—Lessees are working four shafts, prospecting and developing and taking out 35 tons oxidized iron and 25 tons of carbonate ore daily.

Henrietta.—A new shaft-house and other surface improvements have been completed, while the railroad tracks have been put in preparatory to active work, after three years of idleness. The company will ship on a large scale from the low grade carbonate ore bodies.

Leadville-Denver Tunnel & Tramway Co.—The officers are: J. A. Shinn, president; A. C. Phelps, vice-president; Byron Tifft, secretary and treasurer; S. H. Calhoun and E. M. Tucker, directors with the other officers. The company has been formed to run a tunnel through Horseshoe section connecting Lake and Park counties, and it is expected work can begin about April.

Pease Placer.—A new shaft now down 100 ft. is being sunk on this Rock hill territory, and the results on the Reindeer property are very encouraging.

Progressive Mining Co.—This company has resumed work on the ore found some time ago and is making occasional shipments.

Reliance Mining Co.—This company on the Fish-Julia property recently struck a 3-ft. body of low grade ore. The operations are at the 375-ft. level.

Wild Cat.—The several shafts of this com-

bination are now ready for operation, and shipments are soon to start. The shaft started some time ago by lessees, and sunk 100 ft. is to be sunk deeper, and the iron bodies disclosed will be developed. New machinery is being put in.

Yak Mining, Milling & Tunnel Co.—Drifts aggregating 1,500 ft., 300 ft. of upraises, a 160-ft. winze opening up two levels, in which the now celebrated Moyer ore shoot is encountered, is part of the work accomplished by this company the past year, in addition to pushing the big bore almost two miles into the rich territory of the Ibex.

LAS ANIMAS COUNTY.

Majestic.—This mine is being worked by 125 Japs. For two years it was under union rule, the company conceding everything and having 15 strikes.

Union Coal & Coke Co.—The Bowen mine of this company, four miles north of Trinidad, resumed January 5 with 16 men, which was considerably increased later.

Victor Fuel Co.—The Gray creek mine of this company, near Trinidad, resumed work with 43 men on January 6. Every mine of the company in this county, it is reported, is now being worked, through there are some openings still idle.

SUMMIT COUNTY.

Cashier.—The 20-stamp and concentrating mill on this property in Brown's gulch, near Breckenridge is running full time. The ore is said to average from $2 to $3 per ton, with occasional high grade streaks. The low grade ore is worked at a profit, it is stated, and additional stamps will be installed during the year.

Connor's Bonanza.—Rich silver ore is reported opened in this tunnel, near Kokomo.

Gold Cord.—The tunnel of this company, on Jack mountain, near Kokomo, is near the 1,000-ft. mark.

Gold Run Mining & Milling Co.—The Lightburn 7 by 7 ft. tunnel of this company, near Breckenridge is in about 2,000 ft. It is being driven to develop some 50 lode claims and has for its objective a silver-gold-lead ore vein opened on top of the hill by shafts 3,000 ft. from Gold Run gulch and the mouth of the tunnel.

Lawrence.—This property, on Gold hill, near Kokomo, is being worked steadily.

Union Colsolidated.—Work on the lower tunnel of this property, on Gold hill, is progressing. The mine has produced much gold and lead ore.

TELLER COUNTY—CRIPPLE CREEK.

(*From Our Special Correspondent.*)

A force of 75 men working on the Old Gold and C. K. & N. mines are breaking an average of 50 tons per day on both properties. On the C. K. & N. the ore comes from the 275-ft. level, and in the Old Gold from the 350-ft. level. The average value is about 2 oz. per ton.

Abe Lincoln.—Work is pushed on the 600-ft. level of this mine, in Poverty gulch, where about 30 men are employed, and the number will be increased soon. The ore is said to go from 2 to 6 oz. per ton.

Cripple Creek Geological Survey.—F. L. Ransome and A. M. Rock, geologists, returned to the district on Jan. 7, and will push the completion of the work in charge of W. Lindgren. L. C. Greton will soon arrive, when the last of the field work will be completed. The topographical work under the charge of R. T. Evans will be finished as rapidly as possible. Every shaft 10 ft. deep or more and every tunnel, road and shaft-house in the district will be shown on the map.

Doctor-Jack Pot.—There are 15 sets of lessees operating on this ground, located on Raven hill. The property is said to be in fine physical condition.

Gold Sovereign Mining & Tunnel Co.—The three sets of lessees are all breaking ore. The leases expire February 1, 1905, when the company will probably begin operations on its own account. A cyanide mill will probably be built next spring. The company is in good shape financially.

Henry Adney.—This claim in the gulch just west of the El Paso mine, will begin cutting a station at the 300-ft. point and cross-cutting for the ore-shoots of the Old Gold and the C. K. & N.

Jolly Jane.—This is a property on which thousands of dollars have been spent without results. Much stock was sold to people who have long since given up their investment as worthless. Lessee Nelson now reports having struck at 30 ft. a small vein in granite, which assays $25 per ton. The find is about 3,000 ft. south of Stratton Independence.

Trachyte.—A car load of ore from an ore-shoot lately developed in this mine returned 2.27 oz. gold per ton.

Trail Tunnel.—A body of low grade oxidized ore 8 ft. wide is reported opened in the old tunnel on Battle mountain. Cyanide tests are now being made.

W. P. H.—The rich strike recently reported by lessees Harrison and Seaver on Ironclad hill is much discussed. On January 9 the lessees gave out that a shipment of 54 sacks had been made that from assays taken would return 10 to 20 oz. per ton, and on January 13 5 tons were taken to the Eagle sampler, 2 tons of which were estimated to carry $10,000 per ton. The consignment treated January 14 comprised 183 sacks of ore. The United Mines Co., practically owned by the Woods Investment Co., owns some 60 acres in that locality, which includes the W. P. H. claim. The strike was made by lessees, who pay a flat royalty of 30% to the Woods Co.

IDAHO.

IDAHO COUNTY.

Crackerjack.—The power plant, at Hump, is installed and the compressor is expected to be in operation shortly, using electricity. Cross-cutting has exposed 14 ft. of milling ore.

Ima Mining & Milling Co.—The control of this company has changed hands and the properties, at Patterson, will be further tested. If conditions warrant, a large plant may be erected in the spring. The new directors are: Horace Michell, A. H. McLoon and Benjamin Bunker, all of New England. J. W. Taylor, of Columbus, O., president of the company, will be manager.

Wide West and Gracie.—Prospecting is about completed on these properties at Hump and 12 ft. of good ore exposed, running about $17.50 per ton.

(*From Our Special Correspondent.*)

Ajax.—The shaft at Hump is down 174 ft. and cross-cutting has begun. The company has patented three claims and is patenting six more.

Jumbo.—The new Wilfley tables have arrived at Hump. A new hoist has been ordered for the upper levels.

Richmond Consolidated.—This company at Tyson camp on the St. Maries river, reports that the tunnel has cut a pay streak 14 in. wide that pans gold. H. W. Desgranges has been re-elected president.

SHOSHONE COUNTY.

Gold Hunter.—This mine, near Mullan, idle for several months, resumed operations recently with about 25 men, under James Gearen, of Wallace, superintendent. The mill will remain idle for the present, but will be improved.

Neglected.—This mine at Oro Fino shipped steadily throughout the season of 1903, and continued development. The company has a group of 14 claims, but operations have been confined almost exclusively to the Neglected lode. Development consists of a shaft 175 ft. deep, with three levels and drifts aggregating over 2,000 ft. The vein is from 14 to 20 ft. wide. The mill was originally equipped with a 7 by 10 Blake crusher, a 60-ton Monadnock Chilean mill, four amalgamating plates, a spitzkasten, six 6-ft. Frue vanners and two canvass tables. Power was supplied with a 70-h. p. Buckeye engine, with two boilers of 70 h. p. each. In addition to the above there has recently been installed a 128-h. p. Corliss engine and a Sturtevant rolljaw crusher of 150 tons capacity. The company has its own electric light plant and a sawmill, run by electric power. A jig tram to deliver the ore from the mouth of the mine to the mill is under way. About 75 men are employed.

Wild Rose.—The cyanide plant, recently put in on this property, near Pierce, is not effecting the saving expected, and is to be altered. A recent clean-up from eight days run of the stamp-mill is said to have produced $2,500.

(*From Our Special Correspondent.*)

16 *to* 1.—The Bernier interests, which were contesting the patent, have proposed a settlement by relinquishing all their claims in return for 75,000 shares of the stock. Their attorneys have been in Spokane conferring with Finch & Campbell, who have a bond on the 16 to 1 interests. The property has been tied up for several years by litigation. The case is on appeal to the State Supreme Court.

INDIANA.

PARK COUNTY.

(*From Our Special Correspondent.*)

The Cincinnati, Hamilton & Dayton Railway Co. has purchased a large tract of coal land and will build in a spur. The company has had men prospecting for coal for some time and the field selected will be thoroughly developed.

VIGO COUNTY.

(*From Our Special Correspondent.*)

Coal Creek Coal Mining Co.—This company has incorporated with a capital stock of $100,000. It proposes to sink shafts in Lafayette township. The directors are J. S. Tally, M. G. Lee, R. W. Rippetoe & J. W. Landrum.

MINNESOTA.

(*From Our Special Correspondent.*)

What labor conditions in the Lake Superior iron ranges have been the past few years is shown by 2,000 miners going to Europe this winter, expecting to return next spring. Many are men of means. They are Scandinavians, Austrians, Fins, and possibly a few Cornishmen, but the Cornish miner is now almost without exception working by the year in a position of responsibility. The Scandinavian miner is rapidly approaching the same status.

While mining operations in the Lake regions are quiet, and while nearly all independent exploring crews are idle, much is still under way. The Mesabi range is perhaps hurt most by the curtailment. Many Mesabi mines are open pit, and always idle after navigation closes; others will be changed from underground to surface in a short time, and underground Mesabi mines deteriorate less than others during idleness, while the largest share of excess ore on lower lake docks is from the Mesabi.

MISSOURI.

JASPER COUNTY.

Pennsylvania Mining & Smelting Co.—This company, of Bellefonte, Pa., a recent incorporation with a capital stock of $750,000, has acquired and will merge seven big properties in the Joplin district, it is reported. The properties taken over are the Republic, Clinton, Golden Rod, Belleville, Prairie, Blue Jacket No. 2 and the Diamond mine.

ST. FRANCOIS COUNTY.

Central Lead Co.—The miners have again gone on a strike, after working three days. The miners appointed the ringleader of the strike as their arbitrator, and he insisted on a local laborer as the third representative.

The company could not accept, so the men went out again. The mules have been taken out of the mine and sold, the pumps are stopped and the office force has retired.

MONTANA.

JEFFERSON COUNTY.

Carney.—A 16-in. vein of gold ore is reported in a tunnel on one of the claims of this group in the Cataract district.

Pennsylvania & Montana Mining Co.—A 40-h. p. Economic boiler, a No. 7 Knowles sinking pump and a new pattern Ottumwa 18 h. p. hoist have recently been purchased. The shaft is down 80 ft.

Reliance.—The Red Berg Mining Co., of East Helena, has bonded this claim in High Ore gulch, owned by H. T. Jackson and others, and 10 men will be put on under L. E. Dubois, of Butte. The lease and bond has a life of one year. The purchasers have agreed to pay $20,000 for the mine. 25% royalty on all ore now on hand and 15% on all mined hereafter.

MEAGHER COUNTY.

Burke & Sweeney.—John Burke, of Burke & Sweeney, of Yogo, has conveyed to John Crittenden a one-half interest in these sapphire mines, in the Yogo mining district. The consideration is $15,000, payable in three installments.

MADISON COUNTY.

Revenue Mining Co.—A 100-ton cyanide mill is going up on this property near Norris. It is estimated that 25,000 tons of ore are on the old dumps and in the mine workings. High grade ore is shipped. Roger C. Knox is general manager.

St. Domingo Mining Co.—This company recently acquired a lease and bond on the Bonanza claim, near Rochester, and started work. A 50 h. p. Allis-Chalmers hoist, 50 h. p. boiler and a No. 9 Cameron sinking pump have been installed. A 200-ft. vertical shaft is now being sunk. E. M. Hand is manager.

Watseka.—This mine is maintaining a large output. The ores are partly free-milling and partly concentrating, the former coming from the 350-ft. and 400-ft. levels and the latter from the 600-ft. level. The 125-ton concentrating plant is equipped with a 14 by 20 in. Blake crusher, four sets of rolls, two centrifugal pumps, two Huntington mills and 14 Wilfley tables. Forty-mesh screens are used, the concentrates being an 8 to 1 product. A Bates-Corliss 125 h. p. engine furnishes power. The free-milling ores are treated in a 10-stamp mill, below Rochester. C. H. Hand is manager.

OREGON.

BAKER COUNTY.

Cornucopia Mining Co.—This company formed recently to take over the Cornucopia property of 21 claims, 20 miles west of the Snake river and 65 miles from Baker City. A new mill is to be erected on the property which is now equipped with small plants of machinery driven by electricity, generated at a power station about two miles from the mines capable of developing 1,000 h. p. Operations have been conducted for several years, and the veins are developed by several thousand feet of workings. Two deep cross-cut tunnels are to be driven. Bernard McDonald, of Spokane, formerly manager of the Le Roi at Rossland, B. C., is in charge.

Golconda.—A larger electric power plant, it is reported, will be installed to furnish power to run the mill and also light the Golconda mine. J. A. Howard of Sumpter is manager.

Sumpter.—This 200 ton pyritic smelter at Sumpter, built by the Oregon Smelting & Refining Co. was blown in January 2. W. Mueller is general manager and C. B. Neal superintendent.

JOSEPHINE COUNTY.

Almada Mining Co.—A smelter is reported contracted for, to be built on Rogue river, 14 miles from Merlin and run by water power. The company has four claims there. John F. Wickham is managing affairs; O. M. Crouch is president and R. C. Kinney is secretary and treasurer, all of Portland.

LANE COUNTY.

Black Butte.—No quicksilver was produced at this mine near Cottage Grove in 1903. The company is preparing to erect furnaces large enough to give with the present furnace a capacity of 250 to 300 tons of ore daily. The company also expects to complete the installation of a 600 to 1,000 h. p. water-power plant in the spring, the power to be transmitted and used as electricity. In the mine an ore-body 53 ft. wide has been cross-cut on the 850-ft. level. The company in its new furnace plant will give particular attention to treating low grade ore.

PENNSYLVANIA.

ANTHRACITE COAL.

Cameron.—A fire in No. 3 slope of No. 9 vein of this colliery at Shamokin, owned by the Mineral Railroad & Mining Co., has done some damage.

Delaware & Hudson Co.—The No. 2 breaker of this company at Olyphant, one of the largest in the coal regions, was destroyed by fire on January 17. The washery was also destroyed. Nearly 2,000 men and boys are thrown out of work. The loss is estimated at $110,000.

Red Ash.—The strike at this mine, near Wilkes Barre, which started last July, has ended by strikers returning to work. The company granted all the demands except the discharge of Superintendent Jones. The strike was caused by the discharge of a driver boy, and, it is said, was without the orders of the union officials.

BITUMINOUS COAL.

A deal for 5,000 acres of coal land in Montgomery and Cherry Hill townships, Indiana county, is reported closed. Y. E. and J. O. Clark, of Glen Campbell, were the owners, and the purchasers are John P. Elkin, the Beech Creek Coal & Coke Co., and the Indiana Coal Co. The price was $200,000.

Belmont Coal Mining Co.—This company is preparing to push the development of its coal lands along the Baltimore & Ohio railroad, in Belmont county. The entire mine equipment for developing and operating the mines will be bought before spring.

SOUTH DAKOTA.

CUSTER COUNTY.

(*From Our Special Correspondent.*)

Ivanhoe Gold Mining Co.—The machinery has been set up at the shaft. The plant consists of a steam hoist, Sullivan air compressor, 100-h. p. boiler and Cameron pump. H. F. Ratte, of Keystone, is president and manager.

LAWRENCE COUNTY.

(*From Our Special Correspondent.*)

Big Four Gold Mining Co.—The shaft-house destroyed by fire several weeks ago will be rebuilt. As much of the old machinery will be used as possible. A new boiler and electric light dynamo will be purchased.

Globe Gold Mining Co.—This company on its property along Nevada gulch, a short distance from Lead, has a shaft down 500 feet.

Golden Crest Mining Co.—The cyanide plant is treating 48 tons of ore a day.

Hidden Fortune Gold Mining Co.—The first cleanup has been made at the cyanide plant after treating 5,400 tons of ore.

Homestake Mining Co.—Several chemists are constantly at work in the Homestake cyanide mill, endeavoring to devise a method of saving the values in the slimes.

Horseshoe Mining Co.—The recent clean-up at the cyanide plant resulted in a bar of bullion said to be worth $18,000. It is asserted that mine and mill operations will be immediately resumed.

Imperial Gold Mining Co.—The cyanide plant in Deadwood has resumed after an idleness of several months. It is supplied with ore from the company's mines in Black Tail, at Crown Hill and Bald Mountain.

Leo Mining Co.—This company, organized during August, 1903, is doing development work. August Peterson, of Benchmark, is president and is in charge.

Reliance Gold Mining Co.—A railroad spur is being built to the property, and shipments of ore are to be made to the Dorr, Lundberg & Wilson cyanide plant, which is prepared to start up this month.

PENNINGTON COUNTY.

(*From Our Special Correspondent.*)

National Smelting Co.—The company has started the smelter at Rapid City after a short idleness. It is receiving ores from the Horseshoe mines in Lawrence county.

TEXAS.

HARDIN COUNTY.

(*From Our Special Correspondent.*)

Sour Lake Oil Field.—The bottom has dropped out of oil prices, and sales are few, while many wells are idle. The production does not exceed 25,000 bbl. daily, and 25c. is offered for crude, with prospect of lower prices should Batson produce more gushers. The following are new wells since last report; Fannin Oil Co., wildcat, extending the field 1,000 ft. easterly, doing 1,000 bbl. daily; Hughes No. 3, Texas Transit Oil Co., Moonshine No. 6, Higgins Oil Co. No. 6, Hamilton Prince No. 1, Texas Co. No. 25, Spindletop Power Co. No. 2, Swayne-Ford No. 1, Sterling Oil Co., and Burt McGaffy No. 3.

UTAH.

JUAB COUNTY.

(*From Our Special Correspondent.*)

Lower Mammoth.—At the annual meeting recently these directors were chosen: Simon Bamberger, John Dern, W. S. McCornick, A. C. Ellis, Jr., H. G. McMillan and Hugh Park. Simon Bamberger was chosen president. The receipts from the sale of ores during the year were $54,489, while the disbursements aggregated $61,078. In the crude ore shipped out of the mine and from the dump, there was 107,943 oz. of silver, 122.27 oz. of gold, 44,487 oz. of lead and 920 pounds of copper.

Mammoth.—It is claimed that the management and the American Smelting & Refining Co. have come to an agreement concerning smelting rates and that the mine will resume on an extensive scale.

SALT LAKE COUNTY.

(*From Our Special Correspondent.*)

Bingham Consolidated Smelter.—Copper bullion shipments made during the week ending January 15, aggregated approximately 180,000 lb.

Butler-Liberal.—At the annual meeting a board of directors was chosen which organized with A. L. Jacobs, president and general manager; C. N. Strevell, vice-president, and W. P. Lynn, secretary. The financial statement shows the net receipts for the six months prior to January 1, to be $39,043 from the sale of ores and royalties. The total disbursements, including a dividend of $2,500, amounted to $14,781, while the cash on hand January 1, was $16,941.

Continental-Alta.—Connections have been made with the old Livinia stope. The tunnel, caved in for 12 years, has been cleared.

Utah Consolidated Smelter.—The shipments of copper bullion for the week ending January 15 amounted to about 300,000 lb.

United States Smelter.—Plans are practically completed for the installation of lead furnaces for ores in the company's mine at Bingham and Tintic. The shipments of copper bullion during the week ending January 15, amounted to 181,000 lb.

WASHINGTON.

FERRY COUNTY.

(*From Our Special Correspondent.*)

Republic Ore Shipments.—Shipments are light, owing to the mine owners' desire to await a trial of the Mountain Lion ore by the Hendryx process. From January 1 to 14 they were as follows: Nob Hill, 340 tons; Mountain Lion, 760; Quilp, 505; Zala M., 70.

Mountain Lion.—The agitating tank and machinery for the Hendryx process have been delivered, and will be ready in a few days. Dr. Hendryx is looking after its installation. In the mine better ore than usual is coming from the near surface levels. A small hoist is to be erected to raise all the ore from and above the adit level. The ore will go over the old tramway.

Zala M.—The mine is closed pending a change in the company, the particulars of which are not known at Republic. John Fitzwilliams, the superintendent, is at Rossland, B. C., the principal place of business. It is reported the mine was sold to an English company. A drift has been driven from the winze at 58 ft. below the 300-ft. level, on very good ore.

FOREIGN MINING NEWS.

AFRICA.

NATAL.

The Mines Department reports the production of coal in the colony, for the month of November, at 64,340 long tons, an increase of 21,908 tons over November, 1902. The total labor employed during the month was 193 white men, 2,680 negroes, and 1,644 East Indians. Coal exports for November, 1903, were 849 tons, while 20,433 tons were sold to steamers in the port of Durban.

ASIA.

INDIA-MYSORE.

Kolar Gold-field.—The output from this field in December was again large. The total production reported for the year ending with December was 597,786 oz. bullion, against 505,136 oz. in 1902, showing an increase of 92,650 oz. The bullion in 1903 was equal to 538,007 oz. fine gold, or $11,120,605. The production of the leading mines in the district was as follows: Champion Reef, 211,466 oz.; Mysore, 192,897 oz.; Ooregum, 84,698 oz.; Nundydroog, 70,129 oz.; Ballaghat, 27,155 oz.; Mysore West and Wynaad, 11,441 oz. The lead which had been previously held by the Mysore was taken last year by the Champion Reef.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—For the week ending January 9 shipments amounted to 16,272 tons as follows: Granby, 10,650; Mother Lode, 2,690; Emma, 1,350; Oro Denoro, 1,120; Athelstan-Jackpot, 330.

The Granby smelter treated 11,409 tons of ore in six days.

The shipments made from the district for 1903 are reported as follows: Granby, 393,860 tons; Mother Lode, 139,276; B. C., 18,002; Snowshoe, 74,872; Emma, 22,681; Sunset, 13,380; Oro Denoro, 13,759; Athelstan group, 4,693; Winnepeg, 2,144; Morrison, 2,526; Providence, 702; Elkhorn, 317; E. P. U. mines, 180; Goldfinch, 27; sundry shipments, 192; total, 686,614 tons.

BRITISH COLUMBIA—NELSON DISTRICT.

Ymir.—Operations have been considerably restricted during the last two months. The average ore obtained from the lower levels has required extensive sorting. Hand labor has been substituted for rock drills in the mine. Former Superintendent G. H. Barnhart has been placed in full charge of operations.

(*From Our Special Correspondent.*)

Hastings (British Columbia) Exploration Syndicate, Ltd.—The expenses for December at the Arlington mine amounted to $4,135. Shipments were resumed on December 19 and 90 tons of ore were shipped up to the 31st. The returns from these 90 tons will pay the month's expenses, but the payments were not received until January, so will appear in the statement for that month.

BRITISH COLUMBIA—ROSSLAND DISTRICT.

Rossland Ore Shipments.—For the nine days ending January 9, shipments aggregated 11,143 tons as follows: Le Roi, 6,970; Centre Star, 1,530; War Eagle, 1,170; Kootenay, 375; Jumbo, 328; Le Roi No. 2, 540; Le Roi No. 2 (milled), 330.

The shipments from the district for 1903 are reported to be 377,134 tons as follows: Le Roi, 192,000; Centre Star, 81,957; War Eagle, 59,948; Le Roi No. 2, 22,000; Le Roi No. 2 (milled), 2,000; Jumbo, 4,395; Spitzee, 570; I. X. L. (milled), 2,000; Kootenay, 7,606; Giant, 830; Velvet, 3,376; Iron Horse, 40; White Bear, 297; O. K., 25; Homestake, 90.

MEXICO.

CHIHUAHUA.

Peñoles Mining Co.—The new machinery recently installed by this company at Mapimi consists of four boilers, aggregating 2,500 h. p., two Allis-Chalmers engines and two General-Electric three-phase alternating current generators.

The power plant is now in use, the current being transmitted over eight kilometers of wire to the mine. Three months were consumed in arranging and installing the plant, which, completed, has cost about $400,000. The change from steam to electricity was made to concentrate all the power supplies of the company. The old steam plant at the mouth of the mine will be abandoned and part of the machinery put to other uses. The ratchet road hiterto used in transporting coal to the mill will be used exclusively for lowering one to the smelter.

More than 5,000 men are reported employed in the mine in its various shafts and considerable ore is being sent down to the smelter. The working force will probably be increased shortly due to the increased facilities for handling ore.

SONORA.

Yaqui Copper Co.—W. P. Harlow, who organized and became president of this company, has, it is reported, passed his control to William Sauntry, of Stillwater, Minn., and several others for a reported consideration of $1,800,000. John M. Thurston, formerly director and counsel for the company, was elected vice-president. The property is said to include 15,000 acres of mining land and 230,000 acres of other lands.

SOUTH AMERICA.

BRITISH GUIANA.

Exports of gold from the colony in 1903 were 86,480 oz. bullion, against 102,186 oz. in 1902; a decrease of 15,706 oz. The bullion exported in 1903 was equal to 72,877 oz. fine gold, or $1,506,365 in value.

Exports of diamonds were 9,540 carats, valued at $78,757; against 12,231 carats, valued at $121,400 in the previous year.

MINING STOCKS.

(Full quotations given on pages 144 and 145.)

New York, Jan. 20.

Wall Street practically ignores the war news, and there is more strength in the stock market. Securities like United States Steel record an advance. While the regular exchanges are preparing for more active business, a new board, incorporated at Albany on January 15 as the Wall Street Mining & Stock Exchange is completing arrangements to begin its calls at an early date. Twenty-five charter members, at $100 each, make the first quarter of the hundred, which is the limit of membership. The promoters of this exchange are brokers with a long list of shares for sale that are not quoted on either the New York Stock or Consolidated exchanges. The New York public has been treated to several mining exchanges in recent years, and cannot be expected to receive the newcomer with open arms until more is known about it. There is a necessity for such a board, but its stocks must have intrinsic worth, otherwise it will not succeed.

In the regular exchange list the coppers and Comstocks showed interest. Amalgamated Copper moved up to $51.75, and Anaconda to $19.125. On curb, British Columbia Copper, owing to the approach of the consolidation meeting, is attracting more attention, and has advanced from $2.25 to $4.00. Tennessee is stationary at $30.625, while Greene Consolidated, of Mexico, hovers around $13.25. White Knob, of Idaho, sold at $8.25@$8.875, and United of Montana at $8.

In the Comstock section fluctuations are wide. Mexican rose from $1.90 to $2.30; Consolidated California & Virginia fell from $3 to $2; Ophir brought $5.50 as a result of the good returns on ore shipped; Caledonia went off 10c. to $1.10; Best & Belcher held at $2.25, and Union at $1.05. Silver Hill, the Nevada dividend payer, changed hands at 80@82c.

The Colorado shares are sleepy. Elkton Consolidated moved at 47@49c., and Isabella at 12@13c.

Boston. Jan. 19.

(*From Our Special Correspondent.*)

Speculation in copper shares has certainly broadened out, but it is only reflected in a few cases, so far as prices are concerned. Brokers report an increased inquiry and note that the activity is on the up side. A broker to-day said that the market was the most natural one he had seen in this class of stocks for some time.

Utah Consolidated has been well in the lead and trading in it has been very heavy. During the week it touched $35.50, closing less than $1 better than a week back at $34.50. It is concluded that the Standard Oil pressure has been removed from this stock. United States Mining has also given a good account of itself by rising $1.25 to-day, to $20.87½, and holding the advance. This is up from $19 a week ago. Shannon Copper has acted queerly, dipping to $7.25, with subsequent rally to $9.25, and the final to-day at $8.75. This company has made a contract to treat the ores of the Standard Consolidated Copper Co., of Clifton, Ariz. This will increase the Shannon's product about five tons of fine copper per day.

Old Dominion has varied from $9.37½ to $11.50. The newly assented stock has been listed. The Old Dominion Company of Maine has been organized with 350,000 shares, par $25. This is a holding company and owns the shares of the Old Dominion of New Jersey. The general plan is the same as was ruled out by the courts in New Jersey. United Globe stock has been turned over to the new company, also $350,000, to be given with the stock in exchange for 138,000 shares of Old Dominion. James Douglas is president of the new company. Mr. Douglas, and two other of the seven directors, represent the United Globe.

Quincy Mining is off $2 to $98. The strike of the trammers is not reflected in the price of the stock. Centennial is up $1.25, to $17.75, on fairly heavy trading, and Copper Range has varied from $45 to $47. The latter continues inactive. Osceola has advanced $2, to $62; Calumet & Hecla $8, to $448, the latter losing the gain, and Tamarack has gone up $13, to $120 on concentrated buying. Wolverine is $2 higher at $72. United States Coal & Oil spurted a fraction, to $9.50. Parrot is also firm, but dull, gaining to $23.37½. Some of the cheaper class of copper shares show an inclination to be active. Adventure is higher at $3; Allouez at $4.87½; Franklin at $9@$8.50; Isle Royale at $8@$7.75; Mass at $4.87½. Mohawk has moved up $1.50 to $39.50.

The late story regarding the sale of the Maginnis holdings of Boston & Montana stock was not believed in this city, yet this kind of business is likely to work considerable harm to the market.

No change is looked for in the forthcoming Amalgamated dividend. It is said that the Calumet & Hecla will shortly announce an advance in its selling price of copper. The United Zinc Co. announces that it has deferred the current quarterly dividend, owing to the late shutdown.

Colorado Springs. Jan. 15.

(*From Our Special Correspondent.*)

Reports of several strikes in the Cripple Creek district of fabulous values have made the market this week an active one, and prices have fluctuated considerably. The general trend of the quotations is upward, and a continuation of this condition is anticipated. The Granite, El Paso and United Gold Mines companies all report finds of unusually rich ore, but as yet the strikes lack verification. Certain it is, however, that conditions in the camp are improving, and a good number of outside properties are receiving the attention of prospectors. Activity in mining securities should be the natural consequence of this activity in the district.

Salt Lake City. Jan. 9.

(*From Our Special Correspondent.*)

The year 1903 closed with the sales of the year recorded in the books of the Salt Lake Stock and Mining Exchange at 10,388,622 shares, which sold for the sum of $6,270,735. Compared to the previous year, this is a falling off of almost 50%, the sales of 1902 being 20,908,534 shares, which brought $11,609,401. The business of the first half of the year was fairly brisk, which was followed by a decline in the transactions. During the holiday week business was exceedingly light and prices remained practically at a standstill.

San Francisco. Jan. 13.

(*From Our Special Correspondent.*)

The excitement in the market has continued to be Ophir. Buying was active in the first part of the week, and at one time the stock ran up to $8.65. It did not hold at this high price, however, but a reaction followed, natural on this continued advance, and to-day the price settled down to $6.75, with one or two sales under that figure. The other stocks were buoyed up by Ophir in the beginning and receded with it again at the close. Quotations, however, are still very high. Best & Belcher sold at $3; Mexican, $2.95; Consolidated California & Virginia, $2.25; Caledonia, $1.30; Sierra Nevada, $1; Hale & Norcross, 90@95c. It has been a great time for the small dealers, who make their money on quick turns.

The sworn returns of the mining companies, as filed in their offices on Monday, show cash on hand as below, with all expenses paid, unless otherwise noted: Alta, $337, with indebtedness of $1,758; Alpha Consolidated, $465; Andes, $382, with indebtedness of $2,525; Belcher, $5,713, with December expenses partly unpaid; Best & Belcher, $314, with indebtedness of $3,000; Bullion, $1,100; Caledonia, $7,557, with December expenses unpaid; Chollar, $5,625; Challenge Consolidated, $999; Consolidated Imperial, $1,166; Consolidated New York, $3,682; Confidence, $3,029, with December expenses partly unpaid; Exchequer, $2,837; Gould & Curry, $1,047; Justice, $6,141; Lady Washington, $98, with indebtedness of $440; Mexican, $4,684; Ophir, $16,595, with seven car-loads of ore at the reduction works; Overman, $6,484, with December expenses unpaid; Potosi, $4,749; Savage, $4,100; Segregated Belcher, $1,090; Sierra Nevada, $4,195; Silver Hill, $13,853; Standard Consolidated, $86,481, with December expenses and December clean-up to be accounted for; Union Consolidated, $5,256.

The following companies report no cash on hand, with an indebtedness on January 1, as below: Consolidated California & Virginia, $2,296, with $12,000 due on company's notes at the bank; Hale & Norcross, $1,683; Utah Consolidated, $2,044.

On the California Stock & Oil Exchange the only oil stock showing any particular activity was Home, of which a good many sales were made at from $1.10@$1.15. Nevada County brought 42c.; California Standard, 11c.; Lion, 1@2c. At the close prices were rather weak.

COAL TRADE REVIEW.

NEW YORK, Jan. 20.

ANTHRACITE.

Trade conditions during the week have shown but little change. In the retail trade, cold and stormy weather continues to reduce the supplies laid in by many consumers, and to keep in the market those consumers who buy in small lots. Business in the wholesale trade continues to improve under the active retail demand.

In the northwest the movement of coal from Lake Superior docks is seasonably active. In Chicago territory demand, which had shown a falling off under higher temperatures, has once more picked up, and at present there is enough coal moving to make a good, steady business for nearly all dealers. Stocks of coal on the docks are steadily declining. Receipts of coal by rail have been much hampered by the weather causing blockades of cars, but within the past few days the situation has improved materially, and a fair tonnage is now arriving. Along the lower lakes and in Canadian territory demand is fairly brisk, though, perhaps, not as active as in some other territories. Receipts of coal are sufficient for the needs of dealers. In the line trade, farther east, the situation at different points varies considerably, at some the supplies laid in early in the season are still sufficient to check any great increase in wholesale buying; at some wholesale demand is now quite good. Along the Atlantic seaboard there is the same range in conditions that has prevailed for some time. At Boston, where the market has been quiet so far, owing to the heavy stocks in dealers' hands, the brisk buying in the retail trade is having its effect, and a general improvement in the wholesale trade is expected. At New York harbor points retail buying is heavy, and owing to the generally limited capacity of dealers' yards, wholesale trade continues very good.

In line territory the demand for the small steam sizes is strong, as is to be expected with existing weather conditions. It is now probable that shipments from the mines will be good until the end of February. The total shipments from the mines in December are officially estimated at 4,259,748 tons, and the total shipments for last year at 59,362,831 tons. The outlook is for a heavy output during January, though it will not equal the record-breaking figures of last January.

BITUMINOUS.

The Atlantic seaboard bituminous trade continues quiet, though it is thought that the cold weather will help the demand, not only by an increased consumption of fuel, but by cutting down supplies at tidewater through delays in transit by land and by water. Ice is causing much trouble at present. Delaware bay and the upper Chesapeake are both closed, and vessels are having much trouble at some of the unloading ports, particularly at ports beyond Cape Cod.

There is little heard of contracts for the coming year. The present low level of prices and the experience of those consumers who closed contracts early last year both tend to discourage any contracting at this time. It is probable that nothing will be done for a month or more, at any rate not until there has been a general meeting of the trade.

Trade in the far East is quiet. Along Long Island sound consumers are taking considerable coal. The supply is not heavy, and deliveries by water are slow. At New York harbor points there is but little increase in demand, by reason of the weather. Apparently, sufficient coal is arriving to take care of all needs, there being large supplies at the shipping ports. All-rail demand is active, consumers taking a little more coal during the cold weather than they usually take. Prices remain fairly strong on this class of trade, ranging from $1 to $1.25, f. o. b. mines, for good, ordinary grades of Clearfield.

Transportation from the mines to tidewater is fairly prompt, the cold weather not having caused the delays that one might expect. Coal runs through in about a week. Car supply is a little limited, producers not receiving all the cars they ask for. In the coastwise vessel market vessels now get fairly prompt loading at the lower Chesapeake bay ports; the upper Chesapeake is closed by ice. We quote rates as follows: Norfolk and Newport News to Boston and Portland, 70@75c.; New York harbor to Boston and Portland, 80@85c.; to Providence, New Bedford and Long Island sound, 65@70c.

Birmingham. Jan. 18...

(*From Our Special Correspondent.*)

There is no change in the Alabama coal situation this week, the mines being in steady operation and shipments heavy. The Louisiana trade is still using much coal from the Alabama fields. Good prices are being obtained for the product by the producers.

There is much development going on in this State. Contractors have information that between 250 and 300 coke ovens will be constructed in Jefferson county alone this year. There may be ovens constructed in Tuskaloosa and Walker counties also during the year.

During the past week examinations were held in Birmingham for first and second-class mine foremen certificates under the State laws. The examinations were the most rigid ever held in this State, and those who receive the certificates had to go through much questioning and actual demonstration, apparatus being prepared for the examination on gases. The State board of examiners has determined that the mine foremen shall be well versed in the proprieties of gaseous matters and shall be in a position to prevent catastrophes.

Cleveland. Jan. 19.

(*From Our Special Correspondent.*)

The coal trade in this territory is somewhat improved. The long siege of extremely cold weather has produced a situation where coal is very much in demand, all of the stocks having been exhausted and the supply coming directly from the mines. It is a notable fact that while the consumption has been steady and the demand extraordinary during the cold weather the prices have not advanced, Massillon bringing $2.50 at the mines, and other Ohio coals bringing $2 at the mines.

The demand for slack has improved to the extent where a 100% advance in the price has been made. Slack coal is now selling at about $1 at mine, whereas a short time ago it was at 50c. Slack and run-of-mine prices are about the same, the latter being about $1.05 at mine.

The opening of some of the factories has improved the call for steam coal, the situation being better than it has been for the past five or six months. The market generally is firmer. Prices have not advanced. Pittsburg coal is now bringing $1.25 at mine, while Ohio coals bring $1.10@$1.15.

The coke situation is easy. The demand from the furnaces is light and the foundry consumption is far from normal. Prices have held firm at $1.25@$1.60 at oven, for furnace coke, and $2.25@$2.50 for good 72-hour foundry coke. High sulphur cokes are running about $1.90@$2 at oven.

Pittsburg. Jan. 19.

(*From Our Special Correspondent.*)

Coal.—The starting of idle mills has considerably strengthened the coal market. Prices for run-of-mine coal has advanced to $1.20 and $1.30 a ton and some sales have been made at $1.40. The price of slack, which sold a few weeks ago at 45c., has advanced to 85c. Producers are not making any contracts for extended future delivery, and may not until the mining rate for the year is adjusted. There seems to be no doubt now that the miners will insist on an advance. The Pittsburg district convention, which closed on Saturday, unanimously instructed the delegates to the national convention to demand an advance of 10c. a ton, to $1 for pick mining over a 1¼-in. screen and a proportionate increase for machine mining. Similar action was taken at the Ohio State convention last week. The Pittsburg district sent 105 delegates to the convention which opened in Indianapolis yesterday. Last year it sent 49. The increase is due to a larger membership and also to the fact that it has been a prosperous year for the miners, and local unions are financially able to defray the expenses of the delegates. The annual convention of the United Mine Workers will continue in session for 10 days and the joint convention of miners and operators at which the annual mining scale is to be considered will open on January 28.

Connellsville Coke.—More ovens are being started and both production and shipments show gains. Prices for strictly Connellsville coke remain at $1.60@$1.75 for furnace and $2@$2.25 for foundry. An inferior grade of furnace coke can be had at $1.45. The *Courier* in its last issue gives the production for the previous week at 115,503 tons, a gain of over 20,000 tons. The shipments were 6,294 cars, an increase of 1,788 cars, distributed as follows: To Pittsburg and river points, 2,695 cars; to points west of Pittsburg, 2,049; to points east of Everson, 1,450 cars.

San Francisco. Jan. 13.

(*From Our Special Correspondent.*)

The local coal market is quiet, with no material change in prices. Arrivals have been fair.

Pacific coast coals in large lots to dealers are quoted as follows: Wellington and New Wellington, $8; Richmond, $7.50; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coos Bay, $5.50 white ash, $5.25. For Rocky mountain coals, ex-car, to dealers, prices are $14 for Colorado anthracite, $11.50 for Castle Gate, Clear Creek, Rock Springs and Sunnyside. Eastern coal is still nominal at $14 for Pennsylvania anthracite, and $13 for Cumberland, with very light stocks. Foreign coal in cargo lots is quoted at $13 for Welsh anthracite; $8.50 for cannel, $7.50 for Wallsend and Brymbo.

Foreign Coal Trade. Jan. 20.

Congress having taken no action, the suspension of the duty on bituminous coal, for one year, ended on January 15. Such coal is, therefore, now dutiable at 67c. per ton.

Exports of fuel from Great Britain for the full year were as follows, in long tons:

	1902.	1903.		Changes.
Coal	43,159,046	44,950,057	I.	1,791,011
Coke	688,646	717,477	I.	28,831
Briquettes	1,050,256	955,166	D.	95,090
Totals	44,897,948	46,622,700	I.	1,724,752

In addition to these exports there were 16,799,848 tons of coal sent abroad for the use of steamers engaged in foreign trade, against 15,148,115 tons in 1902; an increase of 1,651,733 tons.

Exports of coal from Great Britain to the United States for the full year are reported as below, in long tons:

	1902.	1903.		Changes.
Atlantic ports	742,728	1,070,230	I.	327,502
Pacific ports	94,822	72,373	D.	22,449
Totals	837,550	1,142,603	I.	305,053

The exports to Atlantic ports were chiefly in the earlier months of the year. In December they were only 8,274 tons.

Messrs. Hull, Blyth & Co., of London and Cardiff, report under date of January 8, that the market for best Cardiff coals is firmer, while Monmouthshire description show a slight weakness. Quotations are: Best Welsh steam coal, $3.66@$3.72; seconds, $3.54; thirds, $3.36; dry coals, $3.48; best Monmouthshire, $3.24; seconds, $3.12; best small steam coal, $2.04; seconds, $1.92; other sorts, $1.68.

The above prices for Cardiff coal are all f. o. b. Cardiff, Penarth or Barry, while those for Monmouthshire description are f. o. b Newport, exclusive of wharfage, but inclusive of export duty, and are for cash in 30 days, less 2½% discount.

The freight market remains steady. Some rates quoted from Cardiff are: Marseilles, $1.35; Genoa, $1.44; Naples, $1.44; Las Palmas, $1.38; St. Vincent, $1.50; Rio Janeiro, $2.04; Santos, $2.34; Buenos Ayres, $1.68.

IRON TRADE REVIEW.

New York, Jan. 20.

The expected revival in the iron trade comes slowly, although business shows a little better tone. This has been manifested, however, rather in inquiry and negotiation than in actual practice.

Buying of pig iron continues, but rather on the immediate delivery line, very few contracts running beyond the first quarter, and none beyond the first half of the year. The buying has been mainly of foundry iron and gray forge, very little business being reported in bessemer or basic. The southern furnaces have done fairly well, having cleaned out stocks, as a general rule, and they are now shipping the iron almost as fast as it is turned out.

Reports are current again that the control of the United States Steel Corporation has passed to the Rockefeller interests. Although there is nothing to show positively that such is the fact it does not seem at all unlikely. The sales of Steel Corporation stock have been very large, and prices rather tempting.

Renewed rumors of transfer of large southern interests to the Steel Corporation are denied by parties most in interest.

British Iron and Steel Exports.—The exports of iron and steel, and of machinery, from Great Britain, for the full year, are valued by the Board of Trade returns as follows, in sterling:

	1902.	1903.		Changes.
Iron and steel.	£28,877,337	£30,453,190	I.	£1,575,853
Machinery	18,754,815	20,065,916	I.	1,311,101
New ships	5,871,575	4,285,485	D.	1,586,090
Totals	£53,503,727	£54,804,591	I.	£1,300,864

Exports of mining machinery in 1903 were valued at £782,351, an increase of £234,496 over 1902. Nearly one-half of these, or £359,052 in value, in 1903, went to South Africa.

Some of the leading articles of iron and steel exports were as follows, in long tons:

	1902.	1903.		Changes.
Pig iron	1,102,566	1,065,473	D.	37,093
Rails	716,210	728,156	I.	11,946
Plates	331,272	352,446	I.	21,174
Iron-plates	312,206	293,147	D.	19,059

Shipments of pig iron to the United States in 1903 were 333,258 tons, against 504,251 tons in 1902.

Imports of iron ore in 1903 were 6,313,236 tons, of which 4,945,160 tons were from Spain. This compares with 6,439,757 tons, of which 5,309,733 tons were from Spain, in 1902. The decrease last year was 126,521 tons, or 1.9 per cent.

Birmingham. Jan. 18.

(From Our Special Correspondent.)

The Southern pig iron market situation is quite satisfactory, though buying and shipping are not as active as during November and December. Prices are firm, however, and the sales with some of the companies are aggregating more than the production. According to official figures the stock of surplus iron in this State was something over 189,000 tons on January 1. As to prices, No. 1 foundry is holding firm at $10.50 per ton with $10 asked for No. 2.

The report of the Southern Iron Committee has just been issued, and shows 186,761 tons of pig iron, cast-iron pipe, steel and steel rails shipped last month from the Southern territory. Of this, 173,026 tons were pig iron, the Birmingham district alone shipping 109,994 tons; cast-iron pipe, 8,805 tons; steel rails, 160 tons; steel billets, 765 tons; cast-iron pipe, exported, 180 tons; pig iron, exported, 3,735 tons.

Furnace companies in this district are refraining from selling pig iron beyond April 1, though they have offered to sell in the second quarter of the year at an advance of $1 per ton.

The efforts made to reorganize the pool among the Southern iron manufacturers have availed nothing so far, though it is announced that another meeting will be held this week in New York.

The situation as to furnaces in blast remains the same. The Republic Iron & Steel Co. has started the work of repairing the No. 3 furnace at Thomas, near Birmingham, but as the furnace needs new lining, it will take some weeks.

Cleveland. Jan. 19.

(From Our Special Correspondent.)

Iron Ore.—The movement of ore away from the lakes has continued rather slow, the consumption at the furnaces being light. The demand for the ore is not likely to quicken to any extent soon, as the supplies on hand are sufficient for the coming six months. The matter of prices is being discussed only in a cursory manner. The decision on that point will not be made by the Ore Association for some time to come.

Pig Iron.—The buying of pig iron of the foundry grade has been a little better. The market has improved both in the number and the character of the purchases. The buying, however, is mostly for spot delivery and the few contracts which are coming in now are confined to the first half of the year. The northern price holds steady at $13 in the valleys for No. 2. The market for bessemer and basic can hardly be said to have improved to any material extent. The material is not quotable, no sales having been made.

Finished Material.—The quickening of the demand for structural steel, in anticipation of the opening of the spring building season, has been the feature of the steel market during the past week. The market generally is firm and steady, and the price holds at 1.60c., Pittsburg. There is also a better demand for plates and prices hold at 1.60c. Pittsburg. The tone in the sheet market is also better. The market generally is firm at the old prices, 2.50c. for No. 27 out of stock and 2.35 for the same gauge at the mills.

New York. Jan. 20.

Pig Iron.—The local market shows little change, sales being confined almost wholy to lots of 100 to 200 tons. We quote as follows, for northern irons, good brands: No. 1X foundry, $15.25@$15.75; No. 2X, $14.75@$15.25; No. 2 plain can be had for 50c. less; while gray forge is selling around $13.75. For southern irons on dock quotations are: No. 1 foundry, $14.25; No. 2 foundry, $13.75, with lower grades in proportion. No. 1 soft can be had at about $14.25, and No. 2 soft at $13.75.

Bar Iron and Steel.—Inquiries are more numerous and the outlook has improved. Refined bars are quoted at around 1.45c., in large lots, with steel at about the same. Common iron bars are as low as 1.30c.

Plates.—The market shows no material change from last week, and is quiet. Sheared plates are quoted as follows: Tank, 1¼-in. and heavier, 1.76@1.80c.; flange, 1.95@2.05c.; marine, 2.10@2.15c.

Structural Material.—Demand is, if anything, a very little better. Large lots at tidewater are quoted at 1.75@2c. for beams, angles and channels.

Steel Rails.—The quotations remain $28 for standard sections, f. o. b. mills; light rails, $33@$36, according to weight.

Philadelphia. Jan. 20.

(From Our Special Correspondent.)

The continued sale of the low grades of foundry iron for pipe manufacture affords some hope that other grades will shortly come into request. Quite favorable terms are being offered to the pipe makers and they are buying for forward delivery satisfied that they will not do any better by delay. A great deal of cast pipe business is now coming in sight and only this week specifications were submitted for municipal requirements on a large scale. No. 1 foundry iron is extremely dull and no sales worth reporting have been made. The efforts that were made to make big deals on basic pig have not succeeded. The only transactions were of the usual hand-to-mouth sort. Gray forge iron is at the tail of the list as regards movement and prices. Quotations may be given fairly as follows: No. 1 X foundry $16, for the best brands offered; No. 2 X hangs around $15; No. 2 plain, $14@$14.50. Some business has been done in southern pig, but a strong effort is being made to hold our trade at home.

Billets.—The independents are determined to have all the business that is going and so far appear to be in the way of controlling it. Some few small lots were sold at the official price. There are a few large deals hanging fire. Quotations are $23, but business can be done at a great deal less.

Bars.—Bar iron trade feels much encouraged on account of a movement among certain car building interests to enter into contracts for delivery up to June 30. Up to present writing, however, no contracts of this sort have been closed. Bars range as low as 1.25; steel bars are quoted at 1.40; refined is in better demand.

Plates.—The only demand heard of this week is for tank and boiler plate, including an order or two for locomotive fire-box. Quotations for steel tank are 1.75; boiler steel, 1.85; fire-box, 2c.

Scrap.—The only scrap sold this week was machinery which brought $12.50 per ton.

Pittsburg. Jan. 19.

(From Our Special Correspondent.)

While no heavy contracts for iron and steel has been placed so far this year, there is evidently a large number of small orders being received, which is indicated by the starting of additional mills in this district almost daily. Nearly all the mills in the big Homestead and Duquesne plants of the Carnegie Steel Co. and the big works of the Jones & Laughlin Steel Co. are now in full operation. Large consumers are not contracting for extended future delivery as formerly, but are buying only for immediate requirements. Despite this hesitancy, the outlook for the finished steel market is very promising. In structural material the number of inquiries is increasing, but manufacturers are not endeavoring to book new business by shading prices. Instead it has been suggested that a movement to advance prices might stimulate buying. This was proposed last week at a meeting of steel bar interests and some of the representatives favored an increase of $1 a ton. During the past three years the steel market has been strong at the opening on account of the railroads having placed orders for the year's requirements. This year, however, not more than one-third of the capacity of the rail mills of the country is under contract for delivery in 1904.

Some railroads are reported to have cancelled contracts placed last year. The rail trade has been the foundation for the steel market and it remains to be seen whether the market can get along this spring without it. One of the causes assigned for the full operation of mills this month, despite the fact that new business has not been large, is that producers have been holding back on deliveries until after the first of the year in order to get the benefit of the reduced labor cost, wages in nearly all lines having been cut. The rail mill of the Edgar Thomson steel works was put in operation yesterday, the converting mills having been started on Sunday. The wages of the skilled workmen at this plant are based on the selling price of steel rails, and consequently there was no reduction. It is said the works will be kept in continuous operation. During the shutdown some extensive repairs and improvements were made. The addition to the armor-plate department of the Homestead Steel Works, which was started about two years ago, is about completed. It will be put in operation probably by February 1. The addition includes a machine shop and the largest armor-plate press in the world. The capacity of the plant will be doubled.

The only indication that there is an improvement in the pig iron market is in the starting of more idle blast furnaces. There is no buying of any consequence and prices are weaker. Southern iron is stronger and prices are higher than the northern product. No. 2 foundry is quoted this week at $10.50@$11, Birmingham, or $14.85@$15.35, Pittsburg, while sales have been made of northern No. 2 at $13.85@$14. There is no probability that southern rates will be lowered at present, as it is reported that furnaces have sold for two months ahead. Two more furnaces in the Edgar Thomson group at Braddock have been put in blast, after two months' idleness, and the rest are to be started this week. All of the blast furnaces of Carnegie Steel Co. in this district will be on before February 1. While the independent tin-plate mills are running very slack, the American Sheet & Tin Plate Co. is operating nearly all of its plants to their full capacity. This has occasioned some comment, from the fact that there is no particular demand for plates. Reports are that the product is being stored. The large warehouses at the two plants in New Castle have already been filled and the warehouses of the American Steel & Wire Co. at that place are now being used. It is said that a stock of over 500,000 boxes has been accumulated at these works. It is believed the company either expects a big demand for tin-plate in the summer, or is preparing to make a fight with the Amalgamated Association of Iron, Steel & Tin Workers for a revision of the wage scale when the present one expires on June 30.

Pig Iron.—Small sales, aggregating 2,000 or 3,000 tons, were made during the week according to reports. Bessemer iron is quoted at $13 @$13.25, Valley furnace, or $13.85@$14.10, delivered at Pittsburg. Foundry No. 2 can be had at $13.85@$14, Pittsburg, and gray forge is quoted at $12.75@$13, Pittsburg.

Steel.—The pool price of $23 for bessemer and open-hearth billets is being fairly well observed, although it is believed sales have been made by outside interests at a shade under that figure. The steel bar market is unusually firm and an advance in prices is being discussed. The price of 1.60c. has just been reaffirmed. Plates are being shaded by some outside interests, it is reported, but association members are still quoting 1.60c.

Sheets.—A number of independent mills have been started during the past week under the revised wage scale of the Amalgamated Association and competition is more keen. No. 28 black sheets are selling as low as 2.25c. and galvanized at 3.30@3.35c.

Ferro-manganese.—The demand is not good, and 80% domestic is quoted at $45@$46 per ton.

Cartagena, Spain. Jan. 2.

(Special Report of Barrington & Holt.)

Iron and Manganiferous Ores.—Since our last report there have been shipped two cargoes, 6,150 tons manganiferous ore, and two cargoes, 3,980 tons, dry ore, all to Great Britain.

There is no improvement to be noted in the position of the local ore market, and the New Year finds this Sierra in anything but a flourishing state, many mines being closed and a great many laborers out of work; in fact, the local ore trade is in a very depressed condition. Some of the principal reasons for this are the heavy government taxes on mines and minerals; excessive railway transport; the very high cost of explosives, owing to the explosives monopoly grant; the high wharfage to private wharf-owners, some of the best wharves being private property; the exorbitant rights-of-way that merchants have to pay before getting their minerals on to wharves, and the present costly manner of loading steamers, owing to the absence of mechanical loading apparatus. All these expenses form a heavy load on the mineral industry of this Sierra, which, owing to the scarcity of richer ores, as well as the position of this port for the freight market, makes it difficult to compete with other better situated and richer mining districts.

Prices remain nominally at 6s. 9d.@7s. per ton, f. o. b. shipping port, for ordinary 50% ore; 7s. 3d.@7s. 9d. for special low phosphorus; 8s. 9d. for special ore; 9s. 3d. for 58% specular ore. Magnetic ore, 60% iron, is 11s. 6d. for lump and 9s 6d. for smalls. Manganiferous ores range from 14s. 6d. for 20% manganese and 20 iron, to 9s. 9d. for 12 manganese and 35 iron.

Pyrites.—Iron pyrites, 10% iron and 43% sulphur, are quoted at 10s. 6d. per ton, f. o. b. shipping port. Shipments for the week were 260 tons to Genoa.

CHEMICALS AND MINERALS.

(See also prices-current on page 146.)

NEW YORK, Jan. 20.

Continued improvement is noted both in demand and prices. Further 1904 contracts have been taken, and domestic high-test caustic soda for 1905 delivery sold at $1.75@$1.80 per 100 lb., f. o. b. works. Silver nitrate crystals have advanced rapidly to 37.5c. per oz. for wholesale lots.

The foreign trade of Great Britain in the year 1903 is shown below:

	Exports.	Imports.
Bleaching powder, lb.	123,425,904	27,027,728
Borax, lb.	2,893,968	29,097,712
Brimstone, tons	—	20,068
Cement, tons	400,380	261,219
Chemical manure, tons	445,211	—
Copper sulphate, tons	53,445	—
Nitrate of soda, tons	—	116,715
Phosphates, tons	—	392,714
Salt, tons	585,464	—
Saltpeter, tons	821	10,386
Soda ash, lb.	145,097,792	
caustic, lb.	147,318,864	
bicarb., lb.	35,419,888	35,351,680
crystals, lb.	22,662,304	
saltcake, lb.	112,734,940	
other sorts, lb.	34,862,940	

Imports generally show an increase, while export trade has depreciated in all except bleaching powder, copper sulphate and saltcake—articles that have been benefited by competition with Germany and America.

The ground talc tariff controversy is to be considered by the United States Circuit Court as the Treasury Department is unwilling to accept the decision of the Board of General Appraisers that this product is dutiable at 20% ad valorem as an "unremunerated manufactured article" rather than at 1c. per lb. as "French chalk," under paragraph 13 of the tariff act. Three years have passed since the first decision by the General Appraisers against the Government, on a technicality.

Cyanide.—Aside from a few imports and exports the trade moves along quietly, and prices remain 19.5@20c. per lb.

Bleaching Powder.—Further 1904 contracts booked at $1.25 per 100 lb. for British and American prime bleach, and $1.20 for Continental, with the lower grades at a discount.

Copper Sulphate.—Restricted production in recent years has lightened stocks materially, leaving the market in a position to raise prices whenever there is any prospect of an increased demand. Recently prices have gone up at an unusual rate of speed, and where orders could have been booked last week on the basis of $4.90 per 100 lb. in New York, sellers now ask up to $5.40.

Arsenic.—The failure to centralize the trade abroad is only temporary, as it is believed the aggressive competition in America—an important consumer—will eventually necessitate the formation of some agreement among sellers to avoid complete demoralization in prices. Of course, Great Britain waits for Germany, France for Spain, and Canada and the United States for their competitors to make the overtures first. It seems likely that the larger producers will first agree. At any rate English and German arsenic is selling forward at 3c. per lb., and others correspondingly.

Acids.—Improved demand on contract, and prices firm.

We quote as below, per 100 lb., unless otherwise specified, for large lots in carboys or bulk (in tank cars), delivered in New York and vicinity:

Muriatic, 18°	$1.50	Oxalic, com'l	$5.00@$5.50
Muriatic, 20°	1.60	Sulphuric, 50°,	
Muriatic, 22°	1.75	bulk, ton	13.50@20.00
Nitric, 36°	4.37½	Sulphuric, 60°	15.0
Nitric, 38°	4.75	bulk, ton	18.00@24.50
Nitric, 40°	5.00	ulphuric, 66°	11.00
Nitric, 42°	5.37½	bulk, ton	21.00@23 00

Brimstone.—Odd lots of best unmixed seconds on spot bring $22.75@$23 per ton, while shipments hold at $22@$22.25. Best thirds are nominally 50c. per ton less than seconds.

Pyrites.—Quiet. Ocean freight from Huelva, Spain, to Atlantic ports, 9s. 6d.@10s. ($2.28@$2.40).

We quote domestic pyrites $5 per ton for lump ore, f. o. b. Atlantic coast mines, and 10c. per unit for fines; sulphur content varies from 42@44%. Spanish pyrites, carrying from 46@52% sulphur, are quoted at 11@11.5c. per unit for lump, and 9.5@10c. for fines, delivered at Atlantic ports.

Nitrate of Soda.—The market remains firm at $2.15@$2.20 per 100 lb. for spot deliveries, and $2.05@$2.10 for futures, according to position.

Chilean Nitrate of Soda Market. — Messrs. Jackson Brothers, of Valparaiso, write under date of November 28 as follows: "There has been a fair demand in both qualities. In 95% sales have been made for December at 7s. 1d.@7s. 3d.; January, 7s. 7d.; February-March, 6s. 10d.; April-December, 6s. 6d.; July, 6s.@6s. 2d., and July-December, 6s. 7d.; and in the refined for December-January, 7s. 4d.; February-March, 7s. 2½d., and April-December, 6s. 10d., all alongside terms. The market closes very firm, due to the small amount of nitrate disposable for December-January, and we quote: 95%, December, 7s. 2½d.; January, 7s. 1d.; February, 7s. 2½d.; March, 6s. 10d.; and 96%, December-January, 7s. 3½d.; February-March. 7½s., all ordinary terms, sellers. The price of 7s. 2½d., with an all-round freight of 13s. 9d., stands in 8s. 8½d. per cent, net cost, and freight without purchasing commission. Sales for the fortnight were 1,047,000 qtl., and resales, 114,400 qtl."

Sulphate of Ammonia.—Continues firm. Good gas liquor is now quoted at $3.20@$3.25 per 100 lb.

Phosphates.—Winter trade is uninteresting. Shipments of Florida high-grade rock through Savannah in December amounted to 13,565 tons, making 156,483 tons for the 12 months, as against 185,778 tons in 1902, a decrease of 29,295 tons, or 15%.

Prices for phosphates, per ton, are as follows:

Phosphates.	F. o. b.	C. i. f. Gt. Britain or Europe.
*Fla. hard rock, 77@80%	$7.25@$7.50	$11.12@$12.09
land pebble, 68@73%	3.75@ 4.00	7.70@ 8.05
†Tenn., 78@82%	4.00@ 4.25	10.80@ 11.40
78%	3.75@ 4.00	.....
75%	3.25@ 3.50	.....
73@74%	2.95@ 3.20	.....
‡So. Car. land rock	3.25	.....
river rock	2.75@ 3.00	5.75@ 6.88
Algerian 63@70%	.....	6.00@ 6.60
58@63%	.....	4.95@ 5.09
53@58%	.....	6.15@ 6.60
Tunis (Gafsa)	.....	12.38@ 13.61
Christmas Isle, 80@85%	.....	13.39@ 14.45
Ocean Isle, 82@88%	.....	10.15@ 10.33
Somme, Fr., 70@75%	.....	7.50@ 7.66
Bordeaux, Fr., 60@65%	.....	6.33@ 6.47
55@60%	.....	6.88@ 7.03
Liege, Bel., 60@65%	.....	

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel, Ashley River, S. C.

METAL MARKET.

New York, Jan. 20.

Gold and Silver Exports and Imports,

At all United States Ports in December and Year.

Metal	December.		Year.	
	1902.	1903.	1902.	1903.
Gold:				
Exports.	$2,853,112	$1,464,656	$36,030,591	$44,346,834
Imports.	2,186,636	17,280,298	44,193,317	65,267,696
Excess	E. $666,476	I. $15,785,642	I. $8,162,726	I. $20,920,862
Silver:				
Exports.	5,546,875	5,079,244	49,272,954	39,189,933
Imports.	2,701,286	2,078,655	26,402,935	23,974,508
Excess	E. $2,845,589	E. $3,000,589	E. $22,870,019	E. $15,224,425

These exports and imports cover the totals from all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, New York.

For the week ending January 16 and for years from January 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$70,300	$307,346	$1,108,200	$17,257
1904	179,191	933,055	2,062,510	42,465
1903	26,905	583,629	1,012,436	105,362
1902	1,917,404	50,927	2,908,963	23,282

Silver exports were chiefly to London. Silver receipts have been light so far this year.

The foreign merchandise trade of the United States, for the year ending December 31, is reported as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1902.	1903.
Exports	$1,360,685,933	$1,484,668,127
Imports	969,316,870	995,473,101
Excess exp.	$391,369,063	$489,195,026
Add excess of exports, silver		15,224,425
Total		$504,419,451
Deduct excess of imports, gold		20,920,862
Apparent export balance		$483,498,589

The gold and silver movement in detail will be found in the table at the head of this column.

The statement of the New York banks—including the 56 banks represented in the Clearing House—for the week ending January 16 gives the following totals, comparison being made with the corresponding week of 1903:

	1903.	1904.
Loans and deposits	$886,054,100	$934,395,600
Deposits	901,111,900	941,268,600
Circulation	45,500,300	43,777,000
Specie	168,241,400	181,679,100
Legal tenders	77,253,700	76,819,800
Total reserve	$245,495,100	$258,498,900
Legal requirements	225,277,975	235,317,150
Balance surplus	$20,217,125	$23,181,750

Changes for the week this year were increase of $18,403,400 in loans and discounts $35,555,300 in deposits, $15,277,200 in specie, $2,106,400 in legal tenders, and $8,494,775 in surplus reserve; a decrease of $920,600 in circulation.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports. The amounts are reduced to dollars and comparison is made with the holdings at the corresponding date last year:

	1903.		1904.	
	Gold.	Silver.	Gold.	Silver.
N. Y. Ass'd—	$168,241,400	—	$181,679,100	—
England—	161,137,195	—	156,942,090	—
France—	500,753,465	$218,267,425	468,259,595	$219,860,970
Germany—	161,830,000	56,860,000	156,035,000	54,820,000
Spain—	71,965,000	98,600,000	72,800,000	95,220,000
Netherlands—	23,494,500	32,861,500	22,660,500	32,332,000
Belgium—	15,736,665	7,868,335	16,136,665	8,068,335
Italy—	84,660,000	10,403,000	109,480,000	16,550,000
Russia—	382,865,000	34,065,000	430,250,000	36,565,000
Austria—	231,020,000	62,095,000	231,615,000	59,105,000

The returns of the Associated Banks of New York are of date of January 16, and the others January 14, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

The silver market suddenly collapsed, dropping 1 3-16d. per oz. since January 16. The fall is owing to the withdrawal of the Indian Government from the market. It may, however, be only temporary, and in that event the price should advance.

The United States Assay Officer in New York reports receipts of 81,000 oz. silver for the week.

Shipments of silver from London to the East for the year up to January 7 are reported by Messrs. Pixley & Abell's circular as follows:

	1903.	1904.		Changes.
India	£192,500	£386,789	I.	£194,289
China	.....	.....		.....
Straits	.....	.....		.....
Total	£192,500	£386,789	I.	£194,289

Receipts for the week were £206,000 in bar silver from New York, £5,000 from River Plate, and £8,000 from Australia; total, £219,000. Shipments were £288,109 in bar silver to Bombay, and £10,000 to Calcutta; total, £298,109.

Indian exchange has been strong, in view of the heavy demands for remittances caused by large exports from India and the generally improved condition of the country. The Council bills offered in London were all taken at an average of 16.09d. per rupee. Heavy buying of silver for India has continued, both for coinage and for private account.

Exports of gold from Australia, for the 11 months ending November 30, are reported as follows:

	1902.	1903.		Changes.
Melbourne	£3,229,012	£4,423,017	I.	£1,194,005
Sydney	2,717,913	4,225,868	I.	1,507,955
Adelaide	.....	100,000	I.	100,000
Fremantle	5,526,697	6,885,807	I.	1,359,110
Totals	£11,473,622	£15,634,692	I.	£4,161,070

Of the gold shipped in 1903 a total of £8,078,638 went to India, £1,600,000 to South Africa, £269,801 to Hong Kong, £1,500,000 to San Francisco and £29,619 to New York, the balance went to Great Britain:

The gold and silver movement in Great Britain for the year ending December 31 is reported as follows:

	1902.	1903.		Changes.
Gold:				
Exports	£15,409,088	£27,766,512	I.	£12,357,424
Imports	21,629,049	28,657,393	I.	7,028,344
Excess, imports	£6,219,961	£890,881	D.	£5,329,080
Silver:				
Exports	10,716,118	11,466,726	I.	750,608
Imports	9,764,295	10,310,330	I.	546,035
Excess, exports	£951,823	£1,156,396	I.	£204,573

Of the silver imported in 1903 a total of £7,579,191, or 73.5 per cent of the entire imports, was from the United States.

The advance report of the British Mint for the year 1903 shows that the number of coins struck during the year was as follows:

	Imperial.	Colonial.	Total.
Gold	11,410,684	.....	11,410,684
Silver	15,017,245	40,820,415	55,837,660
Nickel	.....	252,000	252,000
Bronze	38,197,376	9,000,000	47,197,376
Totals	64,625,305	50,072,415	114,697,720

The number of pieces struck in 1902 was 81,108,815 Imperial and 41,277,735 Colonial, a total of 122,386,550. The gold coinage in 1903 fell considerably short of the output of 1902, but in that year the coinage of gold pieces was unusually large, owing to the striking off of the new coins in connection with the new reign and change in design.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars	$0.44	$0.46
Peruvian soles and Chinese.... pesos....	.41	.44
Victoria sovereigns	4.85⅓	4.87
Twenty francs	3.85	3.87
Spanish 25 pesetas	.78	4.82

OTHER METALS.

Daily Prices of Metals in New York.

1904 January	Silver N. Y. Cts.	Silver London, Pence.	Copper Lake, Cts. per lb.	Copper Electrolytic, Cts. per lb.	Copper London, £ per ton.	Tin, Cts. per lb.	Lead, Cts. per lb.	Spelter N. Y., Cts. per lb.	Spelter St. Louis, Cts. per lb.
14	59	27 1/16	12⅝@12¾	12⅛@12⅝	58¼	29¼	4.35@4.40	4.85@4.87½	4.65@4.67½
15	59	27 1/16	12⅝@12¾	12⅛@12⅝	57¾	29¼	4.35@4.40	4.85@4.87½	4.65@4.67½
16	59	27 1/16	12⅝@12¾	12⅛@12⅝	....	29¼	4.35@4.40	4.85@4.87½	4.65@4.67½
18	58⅛	26⅛	12⅝@12¾	12⅛@12⅝	57⅜	28¾	4.35@4.40	4.85@4.87½	4.65@4.67½
19	56⅞	26⅜	12⅝@12¾	12⅛@12⅝	57¾	29	4.35@4.40	4.85@4.87½	4.65@4.67½
20	56⅜	26⅛	12⅝@12¾	12⅛@12⅝	57¾	29⅜@29⅝	4.45@4.50	4.85@4.87½	4.65@4.67½

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wire-bars: the price of electrolytic cathodes is usually 0.25c. lower than these figures

QUOTATIONS ON STERLING EXCHANGE.

January 14	4.85¼	January 18	4.85¼
" 15	4.85¼	" 19	4.8595
" 16	4.85½	" 20	4.8590

Copper. — Dullness has reigned supreme throughout the week, but there has been no pressure to sell and values have been well maintained. The export movement continues large. The closing quotations are given as 12⅝@12¾ for Lake; 12½@12⅝ for electrolytic in ingots, cakes and wirebars, 12¼@12⅜ in cathodes; 12⅛@12⅜ for casting copper.

The market for standard copper in London, which closed last week at £57 15s., opened on Monday at £57 7s. 6d., and the closing quotations on Wednesday are cabled as £57 12s. 6d.@£57 15s. for spot, £57 7s. 6d.@£57 10s. for three months.

Statistics for the first half of January show a decrease in the visible supplies of 700 tons.

Refined and manufactured sorts we quote: English tough, £61 5s.@£61 15s.; best selected, £62 5s.@£62 15s.; strong sheets, £72@£72 5s.; India sheets, £69@£69 5s.; yellow metal, 6⅜d.@6½d.

Exports of copper from New York, Baltimore and Philadelphia in the week ending January 19 were 5,506 tons, making 15,420 tons since the first of the year. Of the grand total Germany received 2,349 tons; Holland, 4,271; Great Britain, 3,045; France, 4,349, the balance going to various other countries. Imports for the week were 190 tons, making 984 tons since January 1, most of which were from Mexico.

Imports and exports of copper in Great Britain, in all forms, were as follows for the full year; the figures are in long tons, the totals being the approximate equivalents in fine copper of all material imported:

	1902.	1903.		Changes.
Copper ore	88,590	84,295	D.	4,295
Matte and precipitate	73,508	76,657	I.	3,149
Fine copper	90,895	63,574	D.	27,321
Total imp's, fine copper	136,508	110,333	D.	26,175
Exports	48,274	54,280	I.	6,006
Balance	88,234	56,053	D.	32,181

Of the imports in 1903, the United States furnished 557 tons ore, 4,900 tons matte and 20,727 tons fine copper; against 871 tons ore, 13,956 tons matte and 41,761 tons fine copper in the previous year.

Tin.—After ruling steady during the balance of last week at 29¼, the market broke suddenly on Monday to 28¾, but has since become firmer again, and the closing quotations are given as 29@29⅛ for spot and futures.

The foreign market, which closed last week at £132 10s. for spot and three months', opened on Monday at £130 5s., and the closing quotations on Wednesday are cabled as £130 5s.@£130 7s. 6d. for spot, £131@£131 2s. 6d. for three months.

Imports of tin into Great Britain with re-exports of foreign tin, for the full year, are reported as follows, in long tons:

	1902.	1903.	Changes.
Straits	27,592	28,071	I. 479
Australia	3,235	4,476	I. 1,241
Other countries	4,324	2,961	D. 1,363
Total imports	35,151	35,508	I. 357
Re-exports	22,976	23,837	I. 861
Net imports	12,175	11,671	D. 504

The decrease in net imports was 4.1 per cent. Straits tin was 79 per cent of the total imports last year.

Lead.—After we went to press last week, the American Smelting & Refining Company announced an advance in prices of $3 per ton, which was followed to-day by another advance of $2 a ton. The closing quotations are given as 4.45@4.50 New York, 4.37½@4.42½ St. Louis. Consumptive demand continues good, and early deliveries are rather scarce.

The foreign market continues to remain very firm, Spanish lead being quoted at £11 16s. 3d. @£11 17s 6d.; English lead, £11 18s. 9d.@£12.

Imports and exports of lead in Great Britain, for the full year, were as follows, in long tons:

	1902.	1903.	Changes.
United States	50,821	39,612	D. 11,209
Spain	104,277	108,580	I. 4,303
Australia	58,778	59,518	I. 740
Other countries	17,937	21,561	I. 3,624
Total imports	231,813	229,271	D. 2,542
Exports	33,009	35,664	I. 2,655
Balance	198,804	193,607	D. 5,197

The lead credited to the United States was chiefly Mexican lead, refined here in bond.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of January 2, that the price of silver during the week has been 13.75 reales per ounce. Exchange has gone up to 34.20 pesetas to £1. Local quotation for pig lead is 61.75 reales per quintal, equal, on current exchange, to 2.17c. per lb., f. o. b. Cartagena.

Spelter has been in very good demand, especially for galvanizing purposes, quite an improvement being reported in the iron and steel trade. The closing quotations are 4.65@4.67½ St. Louis, 4.85@4.87½ New York.

The foreign market is firm, good ordinaries being quoted at £21 15s., specials £22.

Imports and exports of spelter and imports of zinc sheets and other manufactures in Great Britain, for the full year, were as follows, in long tons:

	1902.	1903.	Changes.
Spelter	88,276	85,176	D. 3,100
Zinc manufactures	21,374	22,754	I. 1,380
Total imports	109,650	107,930	D. 1,720
Exports	7,974	7,297	D. 677
Balance	101,676	100,633	D. 1,043

Changes were slight last year. The manufactures reported are chiefly rolled and sheet zinc from Germany and Belgium.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of January 2, that very little has been done. Exports for the week were 1,000 tons blende to Antwerp.

Antimony is quiet and unchanged. The quotations are: Cookson's, 6¾@7c.; Hallett's, 6 @6¼; U. S., Japanese, French, Hungarian, Italian and Chinese at 5⅝@5⅛c. per pound.

Nickel.—The price is quoted by leading producers at 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots, according to quantity, runs as high as 60c. per lb.

Platinum.—Demand continues steady, and the price remains at $19 per oz.

Messrs. Eimer & Amend, of New York, quote prices for platinum in manufaced forms, as follows: Heavy sheet and rod, 72c. per gram; foil and wire, 75c. per gram; platinum crucibles and dishes, 77c. per gram; perforated wire, like cones, Geoch crucibles, etc., 82c. per gram.

Quicksilver.—The New York price is $45.50 per flask for large lots, while a slightly higher figure is quoted for smaller orders. The San Francisco quotations continue at $44@$45 per flask for domestic orders and about $41.50 for export. The London price is £8 5s. per flask, with the same quotation asked by second hands.

Imports of quicksilver into Great Britain, with re-exports of foreign metal, were as follows for the full year, in pounds:

	1902.	1903.	Changes.
Imports	2,489,382	2,616,498	I. 127,116
Re-exports	1,463,937	1,413,498	D. 50,438
Net imports	1,025,445	1,203,000	I. 177,555

The changes were not important. The increase in the net imports was 17.3 per cent.

Cadmium.—According to Herr Paul Speier metallic cadmium was in good demand throughout 1903. Metal containing 99.5% cadmium sold at from 675 to 700 marks per 100 kg., delivered in Berlin.

Minor Metals and Alloys.—Wholesale prices, f. o. b. works, are as follows:

	Per lb		Per lb
Aluminum		Ferro-Tungsten (37½)	38c.
No. 1, 90% ingots	33@37c.	Magnesium, pure (N. Y.)	60c.
No. 2, 95% ingots	31@34c.	Manganese	$2.75
Rolled Sheets	4c. up	Mangan'e Cop. (20% Mn)	32c.
Alum-bronze	20@23c.	Mangan'e Cop. (30% Mn)	38c.
Nickel-alum	33@39c.	Molybdenum (Best)	$1.82
Bismuth	$2.10	Phosphorus, foreign	45c.
Chromium, pure (N. Y.)	80c.	Phosphorus, American	70c.
Copper, red oxide	50c.	Sodium metal	50c.
Ferro-Molybde'm (50%)	$1.25	Tungsten (Best)	62c.
Ferro-Titanium (10%)	90c.		
Ferro-Titanium (20@25% N. Y.	55c.		

Variations in price depend chiefly on size of order.

Missouri Zinc Ore Market. Jan. 16.

(From Our Special Correspondent.)

The only zinc ore that sold as high as $38 per ton the past week was some that was purchased the previous week. The highest straight bid this week was $36. Higher prices were paid, however, where the ore was sold on an assay basis of $34 per ton of 60% zinc, than the straight bid offers. It appears that the purchasing agents are trying to make the market seem weaker, yet, aside from the straight bid offers, there is absolutely no semblance of a decrease, as the assay basis is stronger. A week ago considerable ore was settled for on an assay basis of $30 and $31 per ton of 60% zinc. It is a case of raising the under grades and cutting the best grades, apparently to stem the strong tendency toward advancing prices, or at least to give it a temporary setback.

The real interest of the week was centered in the lead market, which opened with an upward tendency, advancing on Thursday $1.50 per ton, to which was added another $2 per ton to-day at noon, by the Picher Lead Co. The Galena Lead Co. met the first advance, which was made because the Granby Mining & Smelting Co.'s buyer was in the market for this mineral at any price necessary to get a large portion of the output. Aside from the first advance by the Pichers, the next advance was by an agent of the Hoyt Metal Co., of St. Louis, making open offers of 50c. above the market. At this juncture the Granby buyer came into the field. The first offer of the Granby Co. was $58 per ton, which was raised to $58.50, and in one instance to $60.50 for one lot of especially high-grade ore. These prices shut out the Hoyt buyer and he loaded nothing.

Following are the sales of zinc and lead from the various camps of the Joplin district for the week:

	Zinc, lb.	Lead, lb.	Value.
Joplin	2,273,210	279,350	$45,435
Webb City-Carterville	1,699,230	289,750	34,500
Galena-Empire	952,840	272,670	22,455
Duenweg	836,190	69,030	16,165
Alba-Neck	551,950	.....	9,935
Aurora	465,820	12,680	6,435
Prosperity	322,240	26,520	6,230
Carthage	323,780	28,280	5,980
Spurgeon	136,860	110,380	4,320
Granby	312,000	28,500	3,700
Central City	178,610	15,560	3,055
Badger	165,150	6,120	2,985
Carl Junction	160,410	....	2,885
Oronogo	137,350	16,850	2,600
Zincite	131,020	2,650	2,300
Mitchell	61,670	18,420	1,570
Cave Springs	47,340	7,050	980
McDowell	21,000	....	315
Total sales	8,776,670	1,183,810	$172,845
Three weeks	28,096,390	3,799,470	$534,650

Zinc value, the week, $139,585; three weeks, $454,175.
Lead value, the week, $33,260; three weeks, $100,475.

Average Prices of Metals per lb., New York.

Mo.	Tin.		Lead.		Spelter.	
	1903	1904.	1903.	1904.	1903.	1904.
Jan...	28.33	....	4.075	.....	4.865	....
Feb ..	29.43	....	4.075	.....	5.043	....
Mar..	30.15	.....	4.442	.....	5.349	....
April.	29.81	.....	4.567	.....	5.550	....
May .	29.51	.....	4.325	.....	5.639	....
June .	28.34	.....	4.210	.....	5.697	....
July..	27.68	.....	4.075	.....	5.662	....
Aug..	28.29	.....	4.075	.....	5.725	....
Sept..	26.77	.....	4.243	.....	5.686	....
Oct...	25.92	....	4.375	.....	5.510	....
Nov..	25.42	.....	4.218	.....	5.538	....
Dec...	27.41	.....	4.162	.....	4.731	....
Year	28.09	.....	4.237	.....	5.400	....

NOTE.—The average price of spelter in St. Louis for the month of January, 1903, was 4.689c. per lb.; for February, 4.681c.; for March, 5.174c.; for April, 5.375c.; for May, 5.469c.; for June, 5.537c.; for July, 5.507c; August, 5.55c, September 5.514c.; for October, 5.35c; for November, 4.886c; for December, 4.556c; for the year, 5.191 cents.

Average Prices of Copper.

Mo.	New York.				London.	
	Electrolytic.		Lake.		Standard.	
	1903.	1904.	1903.	1904.	1903.	1904.
Jan...	12.159	.....	12.361	.....	53.52	.....
Feb...	12.778	.....	12.901	.....	57.34	.....
Mar..	14.416	.....	14.572	.....	63.85	.....
April.	14.454	.....	14.642	.....	61.72	.....
May ..	14.435	.....	14.618	.....	61.73	.....
June .	13.942	.....	14.212	.....	57.30	.....
July..	13.094	.....	13.341	.....	56.64	.....
Aug..	12.962	.....	13.159	.....	58.44	.....
Sept..	13.205	.....	13.345	.....	56.82	.....
Oct...	12.801	.....	12.954	.....	55 60	.....
Nov..	12.617	.....	12.813	.....	56.30	.....
Dec. .	11.952	.....	12,084	.....	56.36	.....
Year	13.235	.....	13.417	.....	57.97	.....

New York prices are in cents, per pound; London prices in pounds sterling, per long ton of 2,240 lbs., standard copper. The prices for electrolytic copper are for cakes, ingots or wire bars; prices of cathodes are usually 0.25 cent lower.

Average Prices of Silver, per ounce Troy.

Mo.	1902.		1903.		1904.	
	London. Pence.	N. Y., Cents.	London Pence.	N. Y., Cents.	London, Pence.	N. Y., Cents.
Jan..	25.62	55.56	21.98	45.57	.....	.....
Feb..	25.41	55.09	22.11	47.89	.....	.....
Mar..	25.00	54.23	22.49	48.72	.....	.....
April.	24.34	52.72	23.38	50.56	.....	.....
May..	23.71	51.31	24.89	54.11	.....	.....
June .	24.17	52.36	24.29	52.86	.....	.....
July..	24.28	52.88	24.86	53.92	.....	.....
Aug..	24.23	52.52	25.63	55.36	.....	.....
Sept..	23.98	51.53	26.75	58.00	.....	.....
Oct...	23.40	50.57	27.89	60.36	.....	.....
Nov..	22.70	49.07	27.01	58.11	.....	.....
Dec...	22.21	48.03	25.73	55.375	.....	.....
Year	24.09	52.16	24.75	53.45	.....	.....

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

ASSESSMENTS.

Company	Delinquent.	Sale.	Amount.
Andes, Nev.	Feb. 12	Mar. 4	.10
Best & Belcher, Nev.	Jan. 15	Feb. 5	.10
Con. Cal. & Va., Nev.	Jan. 15	Feb. 5	.25
Gould & Curry, Nev.	Feb. 8	Feb. 26	.10
Grape Vine Canyon, Cal.	Feb. 15	.....	.05
Hale & Norcross, Nev.	Jan. 4	Jan. 30	.10
Mayday, Cal.	Jan. 11	Feb. 17	.03
Oswego, Cal.	Feb. 10	.....	.02
Sumdum, Alaska	Feb. 23	.....	.10
Tanana, Cal.	Jan. 18	Feb. 29	.04
Union Con., Nev.	Jan. 11	Feb. 1	.10
Utah Con., Nev.	Feb. 2	Feb. 23	.10
White Pine Copper, Nev.	Feb. 5	.....	.05
Yellow Jacket, Nev.	Jan. 16	Feb. 20	.10

DIVIDENDS.

Company.	Latest Dividend. Payable.	Rate.	Total.	Total to date.
†Allis-Chalmers, pf.	Feb. 1	$1.75	$350,000	$3,213,750
Consolidation Coal, Md.	Feb. 1	4.00	410,000	6,946,650
†Camp Bird, Colo.	Feb. 6	.18	240,000	1,115,304
Fairmont Coal, W. Va.	Feb. 1	2.00	240,000	240,000
•Homestake, S. D.	Jan. 25	.25	54,600	12,422,350
Osceola Copper	Jan. 29	1.00	96,150	4,343,450
†Pittsburg Coal, pf.	Jan. 25	1.75	519,771	8,836,107
Somerset Coal, Pa.	Feb. 1.	2.00	80,000	80,000
Tenn. Copper	Jan. 29	1.25	218,750	437,500
†U. S. Steel Corp., pf.	Feb. 15	1.75	3,614,417	96,491,663

• Monthly. † Quarterly. ‡ Semi-annually.

STOCK QUOTATIONS

NEW YORK.

Company.	Par val.	Jan. 13 H.	Jan. 13 L.	Jan. 14 H.	Jan. 14 L.	Jan. 15 H.	Jan. 15 L.	Jan. 16 H.	Jan. 16 L.	Jan. 18 H.	Jan. 18 L.	Jan. 19 H.	Jan. 19 L.	Sales.
Acacia												.08		1,000
Amalgamated, c.	100	50¼	49⅛	50⅝	49⅝	50⅛	49⅝	50⅛	50	51⅛	50⅛	51¼	51⅛	156,785
Anaconda, c.	25					75	74¾	76		78⅜				567
Anaconda, g.	5			13										200
Andes, s.	7									.50				
Belcher, s.	3	.45		.50										300
Best & Belcher, s.	25									2.25				100
Brunswick, g.	5					.05½						.06		1,500
Bullion, s.	1							.13	.12	.12				900
Caledonia, s.	1	1.25		1.20							1.10			300
Chollar, s., g.	2½	.33	.30	.35				.35				.22		100
Confidence	3											.24		100
Con. Cal. & Va., g. s.	2½					3.00		2.10	2.00	2.00				400
Con. Imperial	1					.05				.06	.06			1,400
Cripple Creek, g.	1													
Crown Point	2½											.28		100
Elkton, g.	1			.47		.48		.48		.49				1,100
El Paso, g.	1													
Gold Dollar, g.	1			.04										4,000
Gould & Curry	1													
Greene Con., c.	10	13⅜	13¼	13⅜	13	13¼	13	13⅛	13⅛	13¼	13⅛	13⅜	13¼	9,450
Hale & Norcross	3	.60						.84	.83	.85				500
Homestake, g.	100	50¼												100
Horn Silver	20													
Isabella, g.	1					.12						.13		1,000
Jack Pot	1													
Julia, s.	1									.09		.08	.07	2,500
Justice, s.	2	.18		.16		.16	.15	.18	.16	.17		.16	.14	3,400
Little Chief, g. s.	50	.08		.08										400
Mexican, s.	3			2.00	1.90	2.10		2.00		2.30	2.25			80
Mollie Gibson, g.	5					.06½	.06							1,600
Moon Anchor, g.	5			.10										500
Moulton, g	25													
Occidental, s.	3													
Ophir, s.	3					5.50						4.25		150
Overman, s.	2			.39	.38									600
Pharmacist, g.	1													
Phœnix, g.	1							.10	.09	.15	.12	.15	.13	6,600
Portland, g.	1													
Potosi, s.	1	.33	.35			.35	.34					.21		800
Savage, s.	3	.75	.60	.54						.66	.65	.54	.47	1,450
Sierra Nevada, s.	3			.90	.85									300
Silver Hill, g. s.	1					.80				.82		.83		400
Small Hopes, g. s.	20													
Standard, g.	10													
Syndicate, g.	1													
Tenn., c.	25			.30⅝		.30⅝								200
Union Con., g. s.	1					1.05								100
Union Copper	25	¾						⅞		⅞		.08		2,300
United, com., c.	100													10
Utah, s.	1	.32				.22								500
White Knob, c.	10					⅞				⅞				110
Yellow Jacket, s.	3													

c—Copper. g—Gold. l—Lead. s—Silver. Total sales, 203,122 shares. † Ex-dividend.

COLORADO SPRINGS (By Telegraph).

Company.	Jan. 18. H.	Jan. 18. L.	Jan. 19. H.	Jan. 19. L.
Acacia	.07		.06⅞	.06
Am. Con.				
Anaconda	.12	.11	.12	.11
Colo. City & M.				
Cripple Ck Con.	.05	.04⅝	.06	.04⅝
C. K. & N.	.13	.12¾	.12½	.12
Doctor-Jack Pot.	.06	.05	.06	.05½
Elkton Con	.57	.53½	.60	.55
El Paso	.61½	.60½	.60⅞	.60¼
Gold Dollar Con.	.04½	.04⅛	.04½	.04⅜
Golden Cycle	.60	.56	.59	.57½
Gold Sovereign	.04⅜	.04	.05	.04⅓
Golden Fleece				
Isabella	.13¼	.10	.11	.10

Company.	Jan. 18. H.	Jan. 18. L.	Jan. 19. H.	Jan. 19. L.
Jack Pot	.05	.04½	.04	.04½
Keystone	.04	.03¾	.04½	.03⅞
Last Dollar	.50	.40	.45	.40
Lexington	.04½	.04	.04½	.04
Little Puck	.03½	.02¼	.03½	.02¼
Mollie Gibson	.05½	.05	.05⅝	.05
Moon Anchor	.09⅜	.08½	.09½	.09¼
New Haven	.02⅞	.02¼	.03	.02⅝
Old Gold	.09	.08⅝	.09½	.08⅝
Pharmacist	.03¾	.03½	.03⅝	.03½
Pinnacle				
Portland	1.50	1.36	1.45	1.35
Vindicator	.70	.55	.70	.55
Work	.03½	.05⅞	.06¼	.06

COLORADO SPRINGS, COLO.*

†Company.	Par Val	Jan. 9 H.	Jan. 9 L.	Jan. 11 H.	Jan. 11 L.	Jan. 12 H.	Jan. 12 L.	Jan. 13 H.	Jan. 13 L.	Jan. 14 H.	Jan. 14 L.	Jan. 15 H.	Jan. 15 L.	Sales
Acacia	$1	.03	.03	.03	.03	.07½	.06¾	.08	.07	.08	.07	.08	.07	
American Con.	1	.02												
Anaconda	5	.10½		.11¼	.10½	.11¼	.10½	.10½		.11	.10½	.11	.10¼	
Colo. City & M.	1	.0305		.01½	.01	.01⅜	.01	.02	.01	.01⅛	.01	.02	.01	2,000
C. K. & N.	1	.14½	.12	.14½	.12	.14	.12	.13	.10	.14	.11	.13¼	.12½	4,000
Cripple Ck. Con.	1	.03½	.03¼	.03⅝	.03	.04⅛	.04	.04		.05	.04¼	.05	.04	9,000
Des Moines	1	.02	.01⅝	.01⅝	.01⅜	.01¾	.01⅜	.01¾	.01⅝	.01⅜		.01⅝	.01	3,000
Doctor Jack Pot.	1	.05	.04¾	.04⅝		.05	.04	.05½	.04⅝	.05¼	.04⅛	.05½		4,000
Elkton Con.	1	.50	.48½	.50	.48	.60	.50	.55	.50	.57	.50½	.55	.50	15,075
El Paso	1	.60	.59½	.58⅛	.57½	.80	.59	.60	.59	.59½	.59¼	.61	.59	13,950
Findley	1													
Gold Dollar Con.	1	.03¾	.03½	.03¾	.03⅜	.04	.03¾	.04	.03⅜	.05	.04	.04⅜	.04	11,000
Gold Sovereign	1	.04	.03¼	.03¼		.04⅛	.03⅛	.04	.03⅜	.04¼	.04	.05	.03⅜	
Golden Cycle	1	.60	.57	.60	.55½	.59	.58⅛	.58½		.63	.58	.60	.56	400
Golden Fleece	1	.05		.05		.05		.05¼		.06¼		.05		
Hart	1	.01½		.01⅜		.01½		.02		.03	.01⅜	.03	.01⅜	
Isabella	1	.10½	.10	.10⅜	.10	.10⅛	.10¼	.10¼		.10		.10		3,000
Jack Pot	1	.05¼		.05¾		.05		.05		.05¼		.05¼	.04½	
Keystone	1	.03	.02¾	.03⅝	.02½	.05	.03¼	.04	.03			.04	.03¾	2,000
Last Dollar	1	.50	.20	.50		.50		.50		.50		.60		
Lexington	1	.04½	.03⅞	.04½		.04½	.04⅛	.04½	.04	.04½	.04	.04¾	.04	6,000
Little Puck	1	.01⅞		.01⅞		.02		.02		.01⅞		.02		1,000
Mollie Gibson	1	.05		.05		.05		.05¼		.06¼		.05		
Moon-Anchor	1	.09⅝	.09⅜	.09¾	.09	.09¼		.09	.08¾	.09½	.08½	.09⅝	.09	6,000
New Haven	1	.02½	.01½	.02¼	.01½	.02⅛	.01¾	.01¾		.02¼	.01½	.02¼	.01¾	1,000
Old Gold	1	.09	.08¾	.09	.08⅝	.09	.08⅝	.08⅝		.09	.08⅜	.09		
Pharmacist	1	.03½	.02⅝	.03½	.02⅝	.03	.02⅝	.03	.02⅛	.03½	.02⅞	.03¼	.02⅞	6,000
Pinnacle	1	.03		.03		.03		.03		.03		.03		
Portland	1	1.45	1.30	1.47	1.37	1.50	1.25	1.25		1.45	1.30	1.50	1.30	100
Vindicator Con.	1	.75		.75		.70	.50	.65	.50	.75	.50	.50		
Work	1	.05½	.04¾	.05¾	.05	.05⅜	.05⅜	.06	.05¼	.05⅝	.05½	.06	.05⅜	4,000

*Colo. Springs Mining Stock Exchange. †All gold mines in Colorado.
Total sales, 91,525 shares.

SAN FRANCISCO (By Telegraph).

Company.	January 18.	January 19.
Belcher	.37	.31
Best & Belcher	1.75	1.80
Caledonia	.95	.97
Challenge Con.	.26	.24
Chollar	.23	.24
Confidence	1.10	1.05
Con. California & Virginia	1.60	1.60
Con. Imperial	.03	.03
Crown Point	.28	.25
Gould & Curry	.39	.38
Hale & Norcross	.66	.64

Name of Company.	January 18.	January 19.
Justice	.15	.13
Mexican	1.65	1.65
Occidental Con.	.72	.92
Ophir	4.50	4.20
Overman	.24	.22
Potosi	.22	.22
Savage	.47	.54
Sierra Nevada	.65	.67
Union Con.	.85	.86
Utah Con.	.16	.12
Yellow Jacket	.44	.39

COAL, IRON AND INDUSTRIAL STOCKS.

Company.	Par val.	Jan. 13 H.	Jan. 13 L.	Jan. 14 H.	Jan. 14 L.	Jan. 15 H.	Jan. 15 L.	Jan. 16 H.	Jan. 16 L.	Jan. 18 H.	Jan. 18 L.	Jan. 19 H.	Jan. 19 L.	Sales
Allis-Chalmers	$100									7¼		5⅝		200
Preferred	100							96				50⅝		120
Am. Agr. Chem	100	14¾	14							14½		14⅝		400
Preferr d	100	73	72¾	75								75½		400
Am. Sm. & Ref.	100	48¼	47¾	48⅝	48¼	48	48		48⅜	48⅜	47⅝	48½	48	4,872
Preferred	100	90⅛	90	90¼		90⅝	90½	90		90	89⅝	90		2,563
Am. Steel Fdy	100													
Preferred	100													
Col. Fuel & I.	100			30	29¾	29				30½	29¼	30½	29¾	1,030
Preferred	100													
Col. & H. C. & I.	100	14½		14⅞	14	14½	14			14⅝	14⅜	14½		1,390
Crucible Steel	100			4				4		4				340
Preferred	100	27	26	27¼	26⅞	27¼	27			28	27	29	28¼	1,136
General Chemical	100	57½		58¼	57½									450
Preferred	50													
Mong. R. Coal	50													
Preferred	100	26		26						25				270
National Lead	100	15½				16	15	16	15⅞	16		15¾	15⅝	4,900
Preferred	100									83				20
Phila. Nat. Gas	100			39½						39½		39¾		150
Preferred	100													
Pittsburg Coal	100	11⅜	10¾	12	11¼	11¼	11	11⅝	11⅜	11⅞	11⅜	11¾	11¼	5,967
Preferred	100	55	49½	52	48	49	48¼	50	47⅞	48¼	47⅞	48¼	48	6,332
Republic I. & S.	100	6⅝		6⅞		6¾		7		7	6¾	7		4,000
Preferred	100	42	41¾	41¾	41½	41⅝		42		42⅞	42¼	43	42¾	3,050
Sloss-Shef S. & I.	100	31½		33	31½					34	33½			6,875
Preferred	100				79					79				200
Standard Oil	100			650				654		659		668	665	21
Tenn. C. I. & R.R.	100	37	36½	37⅛	36¾	37½	36⅞	37¼	36¾	38¾	37½	39	38½	9,305
U.S. Red. & Ref.	100													
Preferred	100													
‡U.S. Steel Corp.	100	10½	10¼	10⅝	10¼	10¾	10½	10¾	10½	11⅜	10⅞	11½	11⅛	44,585
Preferred	100	57⅜	56¾	58	57⅝	58¼	57¼	58⅜	58	†59¾	59⅜	†59⅞	57⅝	208,200
Va.-Car Chem.	100	29	28½	28½		28¾	28½			29½	29	29¼		3,150
Preferred	100									102½		101⅞		259
Va. I. & Coke	100													

†Ex-dividend Total sales, 311,185.

BOSTON, MASS.

Company.	Par val	Jan. 13 H.	Jan. 13 L.	Jan. 14 H.	Jan. 14 L.	Jan. 15 H.	Jan. 15 L.	Jan. 16 H.	Jan. 16 L.	Jan. 18 H.	Jan. 18 L.	Jan. 19 H.	Jan. 19 L.	Sales.
Adventure Con., c	$25	3	2⅛	2¾	2⅜	2¾	2½	2½		3	2½	3	2¾	2,703
Allouez, c.	25	4⅞	4¾	4½		4⅝	4¼	4⅝	4½	4½				323
Amalgamated, c.	100	50½	49½	50⅜	49½	50½	49⅜	50½	50	51⅛	50⅛	51¼	50½	16,439
Am. Gold Dredg.	5													
Am. Z., L. & Sm.	25	10										10		110
Anaconda, c. s.	25													
Arcadian, c.	25	.80										.90	.85	190
Arnold, c.	25	.25										.12		10
Atlantic, c.	25									8¼	8	8⅜	8	250
Bingham Con.	50	22⅞	22½			23	22¼	22½		23		23	22½	603
Bonanza Dev. g.	10													
British Col., c.	5											3¾	3½	700
Calumet & Hecla	25	445		445				440		448	445	440		71
Centennial, c	25			18½		18¾		17¼	16¾	17½	16⅝	17¾	17¼	2,147
Central Oil.	25	7¼		7½	7⅛	7½		.65	.60	.65	.70	.65	.75	180
Con. Mercur, g.	5										.63	.70	.65	3,425
Copper Range	100	46	45½	45⅞	45⅜	45⅝	45	45¼	45⅛	46¾	45¾	47	46¼	5,670
Daly West, g. s.	20			34½	34	35¼	34½	34½		.35	.34½	35	34¾	828
†Dominion Coal	100	68	67	67½	67			67⅝	67			67	66	805
Preferred	100											109		30
Dominion I. & S.	100			9	8¾	8¾	8⅝			8½		8½		570
Elm River, c.	12	2⅜										2⅜		250
Franklin, c.	25	8⅝	8⅜			8½		8¾	8½	9	8¾	9	8⅝	700
Granby Con.	10	3½	3⅜	3¾		3¾				3½		3½		3,650
Guanajuato Con.	5	.97½	.75	.87½		.97½	.80	.85	.80	.90	.80			1,915
Isle Royal Con.	25					8	7½			8	7¾	7¾		810
Mass Con., c.	25			4½	4¼	4¾		4½	4	4⅞	4½	4⅞	4½	1,020
Mayflower, c.	25	.50						.55		.75	.62½			400
Michigan, c.	25							6¼	6	6¼				240
Mohawk, c.	25	38½	37¾	38		38½	38	38¾	38	39½	38¾	39½	39	1,329
Mont. Coal & C.	25					2⅜	2¼	2⅜				2⅜	2¼	520
Mont'l & Boston	5													
New Idria, q.	5									.10				200
Nova Scotia St.	100	79¾												50
Preferred	100													
Old Colony, c.	25			1		1¼						1		80
Old Dominion, c.	25	9½				9¾	9½	11⅞	11	11½	11	11½		1,245
Osceola, c.	25	61	59½					60½	60	61½	60½	61¼		849
Parrot, s. c.	10			22	21⅞	22½	21¾	23	22½	23¾	23	23⅜	23	1,224
Phœnix Con, c.	25	2⅜				5	2⅞	2¾						126
Quincy, c.	25	99	98							1.00	.98	98		81
Rhode Island, c.	25			1½										100
Santa Fe, g. c.	10	8	1¾	1¾				2		2		2	1⅞	330
Shannon, c.	10	100	7¼	7½	7⅜	7⅞	7½	8	7½	9¼	7⅞	9¼	8½	8,415
Tamarack, c.	25			108				112	110	118	114	120	118	319
Tecumseh, c.	25													
Tennessee, c.	25	5⅛												
Trinity, c.	25		4⅞	5	4¾	5	4⅞	5		5½	5	5¼	5	670
Union Ld. & Cop.	25													
United c.	100													
United States, g.	10	19		18⅞		18⅜	18⅛	19⅜	19¼	19½	19¼	20⅛	19⅛	7,460
U. S. Coal & Oil	25					8⅞	8½			9½	9	9⅝	9	1,374
Utah Con., g. c.	5	33	32⅜	33¼	33	35¼	34	35½	34⅜	35⅝	34⅞	35¼	34½	23,338
Victoria, c.	25	3⅜	3¼	3½	3¼			3¾	3½					650
Winona, c.	25	7				7		6⅞		7		7¼		375
Wolverine, c.	25	70				70¼		71		72		72		88
Wyandot, c.	25							1						10

†Ex-dividend. ‡Assessment Paid. Total sales, 92,648 shares.
c—Copper g—Gold. l—Lead. q—Quicksilver. s—Silver.

SAN FRANCISCO.*

Company.	Location.	Jan. 8 H.	Jan. 8 L.	Jan. 9 H.	Jan. 9 L.	Jan. 11 H.	Jan. 11 L.	Jan. 12 H.	Jan. 12 L.	Jan. 13 H.	Jan. 13 L.	Jan. 14 H.	Jan. 14 L.	Sales
Esperanza g.	Nev.													
GoldenAn.Mg.Co	Nev.	.28		.30	.29	.29								* 750
Golconda	Ore.						.15			.28		.27		2,400
MacNamara, g.	Nev.					.11	.10			.12				1,200
Mon.-Tonopah, g	Nev.	.27½	1.20	1.20	1.17½	1.25	1.17½	1.20	1.15	1.17½	1.15	1.22½		7,320
Paymaster	Nev.							.10						
Ray&O'B'nM.Co.	Nev.			.10										
Rescue, g.	Nev.													
South Eureka	Cal.													
Tonopah-Bel't,g.	Nev.	.71	.70	.71	.65	.67		.60		.61		.64	.62	2,600
Ton. Mid. Mg.Co.	Cal.	.41		.41		.44		.44				.43	.42	2,500
Tonopah, Mg.	Nev.	1.12½												100
Tonopah N. S., g.	Nev.	.32	.30	.32		.35		.31	.30	.32	.31	.31		4,300
Ton. Superior	Nev.	.50								.60		.60		1,100

San Francisco and Tonopah Mining Exchange.
†Ex-Dividend g—Gold. Total sales, 22,270 shares

STOCK QUOTATIONS

MEXICO.* Jan. 8

Company.	Shares Issued.	Prices. Bid.	Prices. Ask.
Durango:			
Ca. Min. de Penoles..	2,500	$3,800	$4,100
San Andres de la Sierra	200	10,000	.....
Guanajuato:			
Angustias, Pozos....	2,400	50	60
Cinco Senores y An., aviadoras	2,000	73	80
Cinco Senores y An., aviada	400	73	75
Providencia, SanJuan de la Luz	6,000	65	68
Queensland y Australia	300	68	75
Guerrero:			
Delfina, 1st serie....	2,500	35	40
Delfina, 2nd serie....	2,500	30	40
Garduno y Anexas...	7,200	40	50
Hidalgo:			
Amistad y Condordia	9,600	85	86
Carmen, aviada.....	1,100	120	150
Guadalupe Fresnillo Mill	1,000	160	250
Guadalupe Fresnillo Mine	1,400	70	80
La Blanca, aviadora.	1,536	.....	.....
La Blanca, aviada....	768	.....	.....
La Reina y An., aviadora	5,600	14	17
Luz de Maravillas, aviadas	1,100	.....	20
Maravillas y An., aviador	1,680	120	140
Maravillas el Lobo ..	1,000	130	180
Palma y An., aviador	1,800	10	12
Real del Monte	2,554	.....	.....
Refugio, aviada.....	12,800	5	7
Santa Anay An., aviadora	1,800	95	100
Santa Anay An., aviada	600	30	40
Sta. Gertrudis y An., aviadas	9,600	13	15
Sta. Gertrudis y An., aviadora	28,800	83½	84
Santo Tomas Apostol aviadoras	5,100	2	3
San Felipe de Jesus, aviadora	3,600	18	20
San Felipe de Jesus, aviada	1,200	6	10
San Rafael y An., Trompillo	1,200	1,700	1,730
San Rafael y An., aviada	1,200	690	700
Soledad, aviada.....	900	680	710
Sorpresa, aviada.....	900	340	350
.....	.....	.....	.....

Name of Company.	Shares Issued.	Prices. Bid.	Prices. Ask.
Mexico:			
Alacran.....	2,400	40	50
Aldebarren.....	2,000	45	60
Buen Despacho.....	3,000	55	6a
Dos Estrellas.....	3,000	1,550	1,630
La Esperanza (El Oro.).....	3,000	1,500	1,500
La Reformia, aviadores.....	2,000	33	38
Providencia, pagadoras.....	1,600	.....	.....
Providencia, libera-das.....	900	.....	.....
Santa Ana, Esperanza.....	2,400	90	.....
Michoacan:			
Luz de Borda, aviadora.....	3,000	50	65
Luz de Borda, aviado.....	1,000	26	38
Santiago y An., Tlal..	4,000	6	11
Nuevo Leon:			
La Fraternal.....	1,000	580	620
Norias de Bajan.....	1,000	880	920
San Luis Potosi:			
Concepcion y An.....	3,000	75	90
El Barreno, aviadora.	2,000	35	40
Sta. Maria de la Paz..	2,400	185	190
San Diegoy Annexas.	2,400	10	14
Zacatecas:			
Asturiana y An.....	2,500	65	70
Candelaria y Pinos..	2,500	130	140
Cubiertas.....	2,400	.....	.....
Esperanza y An.....	2,400	6	8
Lourdes.....	2,500	25	32
Luz de Minillas, pagadoras.....	2,000	15	30
Nueva Quebradilla, aviadoras.....	2,400	95	105
Nueva Quebradilla, aviadas.....	600	70	80
San Carlos y Annexas	2,500	120	125
Sta. Maria de Gaud..	2,500	60	65
Miscellaneous:			
Bartolome de Medina	2,000	78	80
Guadalupe Hacienda	20,000	.....	.....
La Luz Hac. (Pachuca.).....	3,750	.....	.....
La Reina (Chihuahua.).....	192	.....	.....
Naica (Chihuahua.)..	100	11,000	13,000
Natividad (Oaxaca) aviadora.....	1,800	1,000	1,050
Natividad (Oaxaca) aviadas.....	600	.....	.....
San Francisco Hac...	6,000	68	69
Santa Ana Huantla Morelos.....	4,000	.....	.....
Union Hacienda.....	3,000	215	230

*Values are in Mexican currency.

TORONTO, ONT. Jan. 16

Company.	Par val	Prices. High.	Prices. Low.	Sales
Black Tail, g.....	$1	.04	.02	.....
Cariboo-McKin.....	1	.06	.03	.....
Cariboo Hydr.....	1	.70	.....	.....
Center Star, g. s....	1	.23½	.22	500
Crows Nest, C.C....	100	2.60	2.00	.....
Dominion Coal.....	100	.68	.67	.....
Dominion S. & I. ..	100	.09	.08½	.....
Fairview, g. s.....	1	.04	.03	.....
Giant, g. s.....	1	.03	.01	.....
Deer Trail, g. s....	1	.02	.01	.....
Iron Mask, g. s.....	1	.06	.....	.....
Morrison, g. s.....	1	.04	02	.....
.....	.....	.....	.....	.....

Company.	Par val	Prices. High.	Prices. Low.	Sales
Granby Smelter...	$10	4.30	3.75	.....
Mountain Lion, g.	1	.18	.14	.....
North Star, g. s..	1	.08	.07	.....
Nova Scotia Steel..	100	.....	.....	.....
Payne, s. l.....	1	.16	.12	.....
Rambler Carib ...	1	.35	.25	.....
Republic, g.....	1	.03	.02	.....
St. Eugene, g. s...	1	.39	.30	.....
Virtue, g. s.....	1	.07	.06	.....
War Eagle Con....	1	.12	.10	.....
Sullivan, g. s.....	1	.07	.03	.....
Winnipeg, g. s....	1	.04	.....	.....
Wonderful, g. s..	1	.03	.....	.....

g—Gold. l—Lead. s—Silver. Total sales, 500.

SALT LAKE CITY.* Jan. 16

Company	Par Val	High	Low	Sales.
Ajax.....	10	.....	.....	.....
Butler Liberal.....	.....	.....	.....	.....
Carisa.....	1	.11½	.10	7,735
Century.....	1	.94	.90	2,300
Con. Mercur...	1	.63¾	.60½	4,450
Daly.....	5	.....	.....	.....
Daly-Judge	1	3.75	3.15	1,225
Daly West.....	20	34.75	34.00	170
Dalton	.....	.....	.....	.....
Grand Central.	1	3.50	.....	450
Ingot.....	½	.02¼	.02⅛	3,000
La Reine.....	1	.02¼	.....	4,000
Little Bell.....	10	.25	.....	100
L. Mammoth..	1	41.00	.....	200
Mammoth.....	25	1.15	1.10	650
May Day.....	¼	.07⅝	.07½	5,500

Name of Company	Par Val	High	Low	Sales.
M. Washington	½	.....	.....	.....
Naildriver.....	2	.62½	.....	100
N. Y. Bonanza.	1	.16	.10¾	3,100
Northern Light	5	.....	.....	.....
Richm'd Anda	1	.....	.....	.....
Sacramento....	5	.21¾	.20¼	11,500
Silver King	.....	.....	.....	.....
Silver Shield...	20	.03⅞	.03½	1,400
Star Con.....	1	.....	.....	.....
Tetro.....	1	.28½	.....	5,000
Uncle Sam Con.	1	.23¾	.22½	10,900
Utah	1	.....	.....	.....
Valeo.....	1	.....	.....	.....
Victor Con.....	1	.06	.04½	1,200
Wabash	1	.03	.03¼	8,500
Yankee Con....	1	.41	.40	2,100

*By our Special Correspondent. All mines are in Utah. Total sales, 68,485 shares.

PHILADELPHIA, PA.*

Name and Location of Co.	Par val.	Jan. 13 H.	Jan. 13 L.	Jan. 14 H.	Jan. 14 L.	Jan. 15 H.	Jan. 15 L.	Jan. 16 H.	Jan. 16 L.	Jan. 18 H.	Jan. 18 L.	Jan. 19 H.	Jan. 19 L.	Sales
Am. Cement.	$10	.....	.....	7¼	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
CambriaI.,Pa.	50	.....	.....	48	.....	48	.....	.....	.....	48	.....	.....	.....	104
CambriaS.,Pa	50	19	.....	19	.....	19	.....	19⅞	19¼	19¾	19¼	20½	19¾	4,435
Pa. Steel, pfd	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Susq. I & S., Pa	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	500
Un'd Gas Imp.	50	86½	.....	87	86⅝	87	.....	87	.....	87⅞	86⅛	87⅞	87	1,411
Lehigh Nav'n	50	64	.....	63¼	62½	64	63	64	.....	.....	.....	.....	.....	564
Philadelphia .	50	.....	.....	40½	39¾	40	.....	40	.....	40¾	40	41	40¾	2,109
U.S. Steel.....	100	10½	10⅜	10½	.....	10⅝	10⅜	10⅝	.....	11¼	10¾	11⅛	11¼	4,765
U.S. Steel. pf.	100	57⅞	56½	57⅞	57⅜	58¼	57⅝	58⅜	58⅛	59	57¼	58½	57⅞	12,357

†Ex-Dividend Total sales 26,247.

LONDON. Jan. 8

Company.	Shares Issued.	Par value. £.	s.	d.	Latest dividend. Amt. s.	d.	Date.	Quotations. Buyers. £	s.	d.	Sellers. £	s.	d.
American:													
Alaska-Treadwell.....	200,000	5	0	0	1	6	Nov., 1903	4	10	0	4	15	0
Anaconda.....	1,200,000	5	0	0	2	0	Nov., 1903	3	16	3	3	18	9
Camp Bird.....	820,000	1	0	0		9	Feb., 1904	1	3	0	1	6	3
Copiapo.....	112,500	2	0	0	6	10	May, 1903		17	6	1	2	6
De Lamar.....	80,000	1	0	0	2	0	Oct., 1903		10	0		12	6
El Oro.....	1,080,000	1	0	0		9	Dec., 1903	1	5	0	1	7	6
Frontino & Bolivia.....	128,682	1	0	0	3	0	July, 1901		6	3		8	9
Le Roi.....	200,000	5	0	0	5	0	Nov., 1899		12	6		15	0
Le Roi No. 2.....	120,000	5	0	0	5	0	May, 1902		16	3		18	9
Montana.....	657,128	1	0	0		6	April 1899		1	0		1	6
Standard.....	500,000		4	0		2½	Sept., 1903		3	0		4	0
*Stratton's Ind.....	1,000,007	1	0	0		6	Dec., 1903		4	6		5	0
St. John delRey	540,265	1	0	0		6	Dec., 1903		14	0		15	0
Tomboy.....	300,000	1	0	0	1	0	June, 1902	1	12	6	1	17	6
Utah Consolidated.....	300,000	1	0	0	6	3	Jan., 1904	5	15	0	6	0	0
Ymir.....	200,000	1	0	0	1	0	Mar., 1902		6	3		8	9
European:													
Linares	15,000	3	0	0	1	0	Mar., 1903	2	10	0	3	0	0
Mason & B.....	185,172	1	0	0	11	0	May, 1903	3	10	0	3	15	2
Rio Tinto.....	325,000	5	0	0	32	6	Nov., 1903	49	10	0	50	0	0
Rio Tinto, pref.....	325,000	5	0	0	2	6	Nov., 1903	5	17	6	6	2	6
Tharsis.....	625,000	2	0	0	6	0	May, 1903	4	12	6	4	17	6
West Australian:													
Associated.....	495,388	1	0	0	2	0	Jan., 1904	2	12	6	2	13	9
Cosmopolitan Prop.....	400,000	1	0	0	1	0	May, 1903		14	6		15	6
Golden Horse Shoe	300,000	5	0	0	6	0	Nov., 1903	8	12	6	8	15	0
*Great Boulder Prop...	1,750,000		2	0		9	Dec., 1903	1	6	3	1	6	9
Great Fingall Consol..	250,000	1	0	0	8	0	Jan., 1904	8	2	6	8	5	0
Ivanhoe.....	200,000	5	0	0	5	0	Jan., 1904	8	13	9	8	16	3
Kalgurli.....	120,000	1	0	0	2	6	Jan., 1904	5	6	3	5	8	9
Lake View Consols	250,000	1	0	0	rts.		Aug., 1902	1	8	9	1	11	3
*Oroya-Brownhill	450,000	1	0	0	2	6	Dec., 1903	3	10	0	3	12	6
Miscellaneous:													
*BrilliantCen. Queens..	100,000	1	0	0	1	0	Jan., 1904	2	17	6	3	2	6
Briseis	600,000	1	0	0	..	..	.....		6	0		6	6
BrokenHill.....	960,000		8	0	1	0	Aug., 1903	1	8	6	1	9	6
Mt. Lyell	275,000	3	0	0	4	3	Sept., 1903		19	0	1	1	0
Mt.Morgan.....	1,000,000	1	0	0		3	Jan., 1904	2	2	6	2	7	6
Waihi.....	497,412	1	0	0	2	6	Dec., 1903	4	17	6	5	0	0
Indian:													
Champion Reef.....	513,832		10	0	6	6	Jan., 1904	7	18	9	8	1	3
Mysore.....	566,043		10	0	4	4	Jan., 1904	6	10	0	6	12	6
Nundydroog.....	484,000		10	0	1	6	Nov., 1903	2	2	6	2	5	0
Ooregum	343,000		10	0		9	Dec., 1903	1	1	3	1	3	9
Ooregum, pref.....	240,000		10	0	1	9	Dec., 1903	1	11	3	1	13	9
South African:													
Angelo.....	600,000	1	0	0	4	0	Jan., 1904	6	10	0	6	15	0
Bonanza.....	200,000	1	0	0	10	0	Feb., 1904	2	3	9	2	6	3
British South Africa....	4,436,019	1	0	0	rts.		May, 1899	2	2	6	2	3	9
Cape Copper.....	300,000	2	0	0	4	0	Jan., 1904	3	2	6	3	5	0
Cape Copper, pref.....	75,000	2	0	0	1	9	Jan., 1904	3	0	0	3	5	0
City & Suburban.....	340,000	4	0	0	8	0	Feb., 1904	6	7	6	6	12	6
Consol. Gold-Fields....	2,000,000	1	0	0	..	..	.....	6	3	9	6	6	3
Crown Reef.....	120,000	1	0	0	20	0	Oct., 1903	17	0	0	17	10	0
De Beers Con.....	800,000	2	10	0	10	0	Jan., 1904	19	3	9	19	6	3
De Beers Con., def.....	1,000,000	2	10	0	15	0	Jan., 1904	19	18	3	20	1	3
East RandProprietary..	900,000	1	0	0	5	0	Aug., 1903	6	12	6	6	13	9
Ferreira.....	90,000	1	0	0	22	6	Feb., 1904	19	15	0	20	5	0
Geldenhuis Estate.....	200,000	1	0	0	6	0	Feb., 1904	6	2	6	6	5	0
Geduld.....	400,000	1	0	0	rts.		Mar., 1902	6	3	9	6	6	3
Henry Nourse.....	125,000	1	0	0	10	0	Feb., 1904	8	7	6	8	12	6
Jubilee.....	50,000	1	0	0	5	0	Feb., 1904	4	12	6	4	17	6
Jumpers.....	100,000	1	0	0	5	0	Aug., 1899	2	17	6	3	2	6
Langlaagte Estate ..	470,000	1	0	0	2	0	Feb., 1904	3	12	6	3	15	0
May Consolidated.....	288,750	1	0	0	3	6	Feb., 1904	4	0	0	4	2	6
Meyer & Charlton.....	100,000	1	0	0	5	0	Jan., 1904	5	12	6	5	17	6
Modderfontein	290,000	1	0	0	rts.		Apr., 1902	8	7	6	8	10	0
Namaqua	94,331	2	0	0	3	0	Dec., 1903	3	0	0	3	5	0
New Jagersfontein..	200,000	5	0	0	10	0	Dec., 1903	28	2	6	28	7	6
New Primrose.....	325,000	1	0	0	3	0	Jan., 1904	3	13	9	3	16	3
Rand Mines.....	1,795,956		5	0	4	0	Aug., 1902	9	7	6	9	8	9
Robinson.....	750,000	5	0	0	5	6	Feb., 1904	9	10	3	9	15	0
Robinson Deep.....	950,000	1	0	0	3	0	Jan., 1904	5	5	0	5	10	0
Rose Deep.....	425,000	1	0	0	2	6	Feb., 1904	7	12	6	7	17	6
Salisbury	100,000	1	0	0	2	0	Mar., 1899	1	10	0	1	15	0
Sheba.....	1,075,000	1	0	0		6	July, 1899		11	3		13	9
Village Main.....	400,000	1	0	0	3	0	Feb., 1904	7	7	6	7	12	6
Wemmer.....	80,000	1	0	0	10	0	Jan., 1904	11	0	0	11	10	0

c—Copper. d—Diamonds. g—Gold. l—Lead. s—Silver. t—Tin. *Ex-dividend.

LONDON (By Cable.)*

Company.	Jan. 13 £.	s.	d.	Jan. 20 £.	s.	d.	Company.	Jan. 13 £.	s.	d.	Jan. 20 £.	s.	d.
Anaconda.....	3	17	6	3	17	6	El Oro, Mex.....	1	5	7½	1	3	1½
British So. Africa.	2	3	9	2	3	9	Modderfontein....	8	11	3	8	8	9
Camp Bird.....	1	5	4	1	5	10½	Rand Mines.....	9	11	3	9	13	9
Con. Gold Fields.	9	6	3	8	8	9	Rio Tinto	50	0	10	50	7	6
De Beers Con.def.	20	0	0	20	2	6	Simmer & Jack...	1	11	3	1	11	3
East Rand.....	6	15	0	6	13	9	Tomboy.....	1	12	6	1	12	6

*Furnished by Wm. P. Bonbright & Co., 15 Wall St., New York.

PARIS. Dec. 30

Company.		Capital Stock. Francs.	Par value. Fr.	Latest divs. Fr.	Prices. Opening. Fr.	Prices. Closing. Fr.
Anzin, Coal.....	France	.....	.....	290.00	5,575.00	5,570.00
Boleo, c.....	Lower Cal....	12,000,000	500	62.50	1,750.00	1,750.00
Champ d'Or, g.....	S. Africa.....	3,375,000	25	3.75	20.00	19.00
Courrieres, Coal.....	France	600,000	300	110.00	2,862.00	2,895.00
Fraser River, g.....	Brit. Col....	250,000	25	.....	5.50	5.50
Huanchaca, s.....	Bolivia.....	40,000,000	125	5.00	76.00	76.00
Laurium, z. l.....	Greece.....	16,300,000	500	25.00	349.00	343.00
Malfidano, z.....	Italy	12,500,000	500	50.00	564.00	560.00
Metaux, Cie. Fran. de.....	France	25,000,000	500	22.50	493.00	493.00
Mokta-el-Hadid, i. l.....	Algeria	18,312,000	500	40.00	845.00	835.00
Nickel, n.....	N. Caledonia..	15,000,000	250	22.50	509.00	509.00
Penarroya, Coal	Spain.....	.....	500	45.00	1,135.00	1,130.00
Vielle Montagne z.....	Belgium.....	9,000,000	30	30.00	676.00	675.00
Wyoming, o.....	California.....	.....	25	.....	324.00	320.00

c—Copper. g—Gold. i—Iron. l—Lead. n—Nickel. o—Oil. s—Silver. z—Zinc.

ST. LOUIS, MO.* Jan. 16

Name.	Par Val.	Prices. Bid.	Prices. Ask.
Am.-Nettie, Colo....	$10	$0.25	$0.50
Catherine Lead,Mo.	10	.90	1.50
Central Coal & C....	100	58.00	59.00
Central C. & C., pf..	100	70.50	71.50
Central Lead, Mo...	100	110.00	115.00

Name.	Par Val.	Prices. Bid.	Prices. Ask.
Columbia Lead,Mo.	$10	$3.50	$4.50
Con. Coal, Ill.....	100	20.00	21.00
Doe Run Lead Mo.	100	110.00	115.00
Granite Bimet. Mt..	10	.45	.50
St. Joe Lead, Mo,...	10	15.25	17.00

*By our Special Correspondent.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

(See also Market Reviews.)

ABRASIVES—		
Carborundum, f.o.b. Niagara Falls, Powd.,	lb.	$0.08
Grains	"	.10
Corundum, N. C.	"	.07@.10
Chester, Mass.	"	.04½@.05
Barry's Bay, Ont.	"	.07½@.09½
Mont. f.o.b. Chicago	"	.07@.07½
Crushed Steel, f.o.b. Pittsburg	"	.05½
Emery, in kegs: Turkish flour	"	.03½
Grains	"	.05@.05½
Naxos flour	"	.03½
Grains	"	.05@.05½
Chester flour	"	.03½
Grains	"	.05@.05½
Peekskill, f.o.b. Easton, Pa., flour	"	.01½
Grains, in kegs	"	.02½
Crude, ex-ship N. Y.: Abbott (Turkey)	lg. ton	26.50@30.00
Kuluk (Turkey)	"	22.00@24.00
Naxos (Greek) h.gr.	"	26.00
Garnet, per quality	sh. ton	25.00@35.00
Pumice Stone, Am. Powd	lb.	.01½@.02
Italian, powdered	"	.01½
Lump, per quality	"	.04@.05
Rottenstone, ground	"	.02½@.04½
Lump, per quality	"	.06@.20
Rouge, per quality	"	.10@.30
Steel Emery, f.o.b. Pittsburg	"	.07
ACIDS—		
Boracic, crystals	"	.10¾@.11
Powdered	"	.11¼@.11½
Carbonic, liquid gas	"	.12½
Chromic, crude	"	.20
Hydrofluoric, 30%	"	.03
48%	"	.05
60%	"	.11
Sulphurous, liquid anhy. f.o.b. Bound Brook, N. J.	"	.06
ALCOHOL—Grain	gal	2.46@2.48
Refined wood, 95@97%.	"	.50@.55
Purified.	"	1.25@1.30
ALUM—Lump	100 lbs.	1.75
Ground	"	1.85
Porous	"	1.00
Powdered	"	3.00
Chrome, com'l	"	2.75@3.00
ALUMINUM—		
Nitrate	lb.	1.50
Oxide, com'l, common	"	.06½
Best	"	.20
Pure	"	.80
Hydrated	100 lbs.	2.60
Sulphate, com'l	"	1.25@1.50
AMMONIA—		
Aqua, 16°	lb.	.03
18°	"	.03¼
20°	"	.03¾
26°	"	.05½
AMMONIUM—		
Carbonate, lump	"	.07½
Powdered	"	.08¼
Muriate gram	"	.05⅝
Lump	"	.09½
Nitrate, white pure (99%)	"	.12
Phosphate, com'l	"	.09
Pure	"	.12
ANTIMONY—Glass	"	.30@.40
Needle, lump	"	.05½@.06
Powdered, ordinary	"	.05¾@.07¾
Oxide, com'l white, 95%	"	.09½
Com'l white, 95%	"	.12
Com'l gray	"	.07
Sulphuret, com'l	"	.16
ARSENIC—White	"	.03@.03½
Red	"	.06⅝@.06¾
ASPHALTUM—		
Barbadoes	"	.02½@.03
Ventura, Cal.	sh. ton	32.00
Cuban	lb.	.01¼@.03½
Egyptian, crude	"	.05½@.06
Trinidad, refined	sh. ton	35.00
San Valentino (Italian)	lg. ton	16.00
Seyssel (French), mastic	sh. ton	21 00
Gilsonite, Utah, ordin'y	lb.	.03
Select	"	.03¾

BARIUM—		
Carb. Lump, 80@90%	sh. ton	$25.00@27.00
92@98%	"	26.00@29.00
Powdered, 80@90%	lb.	.01¾@.02
Chloride, com'l	100 lbs.	1.67½@1.76
Chem. pure cryst	lb.	.05
Nitrate, powdered	"	.05⅞
BARIUM—		
Sulphate (Blanc Fixe)	lb.	$0.02
BARYTES—		
Am. Crude, No. 1	sh. ton	9.75
Crude, No. 2	"	8.00
Crude, No. 3	"	7.00
Floated	"	18.50
Foreign gray	"	13.50
Snow white	"	17.25
Floated	"	18.75
BAUXITE—Ga. or Ala. Mines:		
First grade	lg. ton	5.50
Second grade	"	4.75
BISMUTH—Subnitrate	lb.	2.00
Subcarbonate	"	2.25
BITUMEN—"B"	"	.03¼
"A"	"	.05
BONE ASH	"	.02½@.02¼
BORAX	"	.07¼@.07½
BROMIDE—Bulk	"	.48
CADMIUM—Metallic	"	1.40
Sulphate	100 lbs.	2.00@2.50
CALCIUM—Acetate, gray	"	1.40
" brown	"	.90
Carbide, ton lots f.o.b. Niagara Falls, N. Y.. for Jersey City, N. J.	sh. ton	70.00
Carbonate, ppt	lb.	.05
Chloride	100 lbs.	.70@.90
CEMENT—		
Portland, Am., 400 lbs.	bbl.	1.50@1.75
Foreign	"	1.75@2.25
"Rosendale," 300 lbs	"	.85
Slag cement,	"	1.25@1.50
CERESINE—		
Orange and Yellow	lb.	.13
White	"	.14
CHALK—Lump, bulk	sh. ton	3.00
Ppt. per quality	lb.	.04@.05¼
CHLORINE—Liquid	"	.30
Water	"	.10
CHROME ORE—		
(50% ch.) ex-ship N. Y.	lg. ton	24.75
Bricks f.o.b. Pittsburg	M	175.00
CLAY, CHINE—Am. com., exdock, N. Y.	lg. ton	8.25
Am. best, ex-dock, N. Y	"	9.25
English, common	"	10.75
Best grade	"	16.75
Fire Clay, ordinary	sh. ton	4.25
Best	"	6.00
Slip Clay	"	5.00
COAL TAR PITCH	gal.	.08
COBALT—Carbonate	lb.	1 75
Nitrate	"	1.50
Oxide—Black	"	2.50
Smalt, blue ordinary	"	.06
Best	"	.20
COPPERAS—Bulk	100 lbs.	.47½
In bbls	"	.52½
COPPER—Carbonate	lb.	.18@.19
Chloride	"	.25
Nitrate, crystals	"	.35
Oxide, com'l	"	.19
CRYOLITE	"	.06½
EXPLOSIVES—		
Blasting powder, A	25-lb. keg	.65
Blasting powder, B	"	1.40
"Rackarock," A	lb.	.25
"Rackarock," B	"	.18
Judson R.R. powder	"	.10
Dynamite (20% nitro-glycerine)	"	.13
(30% nitro-glycerine)	"	.14
(40% nitro-glycerine)	"	.15
(50% nitro-glycerine)	"	.16½
(60% nitro-glycerine)	"	.18
(75% nitro-glycerine)	"	.21
Glycerine for nitro	"	.12½@.12⅝
FELDSPAR—Ground	sh. ton	@10.00
FLINT PEBBLES—Danish. Best	lg. ton	14.75
French, Best	"	11.75
FLUORSPAR—		
Lump	sh. ton	8.00@10.00
Ground	"	11.50@13.50

FULLER'S EARTH—Lump	100 lbs.	$.80
Powdered	"	.85
GRAPHITE—Am. f.o.b. Providence, R.I., lump	sh. ton	8.00
Pulverized	"	30.00
Am. pulv., other than R. I., f. o. b., New York	"	45.00
Best flake	"	150.00
German, com. pulv	lb.	.01¼@.01½
Best pulverized	"	.01½@.02
Ceylon, common pulv	"	.02¾@.03½
Best pulverized	"	.04@.08
Italian, pulverized	"	.01¼
GYPSUM—Ground	sh. ton	8.00@8.50
Fertilizer	"	7.00
Rock	lg. ton	4.00
English and French	"	14.00@16.00
INFUSORIAL EARTH—Ground.		
American best	"	20.00
French	"	37.50
German	"	40.00
IODINE—Crude	100lbs	2.45
IRON—Muriate	lb.	.05
Nitrate, com'l.	"	.01¼
True	"	.04
Oxide, pure copperas color	"	.05@.10
Purple-brown	"	.02
Venetian red	"	.01@.01½
Scale	"	.01@.03
KAOLIN—(See China Clay.)		
KRYOLITH—(See Cryolite.)		
LEAD—Acetate, white	lb.	.08¼ @ .8¾
Brown	"	.06½@.06¾
Nitrate, com'l	"	.06½
" gran	"	.08¼
LIME—Com., abt. 250 lbs	bbl.	.80
Finishing	"	1.02
MAGNESITE—Greece.		
Crude (95%)	lg. ton	5.00@5.50
Calcined	sh. ton	15.50
Bricks, best imp., f.o.b. N.Y.	M.	155.00
Bricks, domes., per qual., f.o.b. Pittsburg	"	160.00@200.00
MAGNESIUM—		
Carbonate, light, fine pd	lb.	.05
Blocks	"	.07@.09
Chloride, com'l	"	.01¾
Fused	"	.20
Nitrate	"	.60
Sulphate	100 lbs.	.75@.95
MANGANESE—		
Crude powd. 70@75% binoxide	lb.	.01¼@ 01½
75@85% binoxide	"	.01½@.02¾
85@90% binoxide	"	.02¾@.03¼
90@95% binoxide	"	.03¼@.05½
Carbonate	"	.16@.20
Chloride	"	.04
Ore	unit	.12@.20
MARBLE—Flour	sh. ton	6.00@7.00
MERCURY—Bichloride	lb.	.77
MICA—N. Y. gr'nd, coarse	sh. ton	33.00@38.00
Fine	lb.	.00¾@.02
Sheets are sold as to size and quality		
MINERAL WOOL—		
Slag, ordinary	sh. ton	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
Selected	"	40.00
NICKEL—Oxide, No. 1.	lb.	1.00
No. 2	"	.60
Sulphate	"	.20@.21
OILS—Black, reduced 29 gr.		
25@30, cold test	gal.	.13½@.13¾
15, cold test	"	.13¾@.14½
Zero	"	.18@.19
Summer	"	.12¾@.13¾
Cylinder, dark steam ref	"	.14½@.15½
Dark, filtered	"	.18½@.19½
Light, filtered	"	.21¼@.22¾
Extra cold test	"	.25¼@.31½
Gasoline, 86° @90°	"	.17@.22
Naphtha, crude, 68°@72°	bbl.	12.40
"Stove"	gal.	.15
Linseed, domestic raw	"	.35@.37
Boiled	"	.39
Calcutta, raw	"	.65
OZOKERITE	lb.	.11½
PAINTS AND COLORS—		
Chrome green, common	"	.03
Pure	"	.16
Yellow, common	"	10¾
Best	"	.14
Lampblack, com'l.		.04½
Refined		.07
Litharge, Am. pow'd.	"	.05¾@.05¾
English Glassmakers'	"	.08¼@.08⅞
Metallic, brown	sh. ton	19.00
Red	"	16 00
Ocher, Am. common	"	8.50@9.00
Best	"	21.25@25.00
Dutch, washed	lb.	.08
French, washed	"	.01¼@.01⅞
Orange mineral, Am	"	.07⅝@.07¾
Foreign, as to make	"	.08½@.10¼
Paris green, pure, bulk	"	.11

PAINTS AND COLORS—		
Red lead, American	lb	$0.06¼@$0.06½
Foreign	"	.07@.08¼
Turpentine, spirits	gal.	.68½@.69
White lead, Am., dry	lb.	.04¾@.05
American, in oil	"	.05¼@.06½
Foreign, in oil	"	.09 @.09⅛
Zinc, white, Am., ex. dry	"	.04⅝@.04¾
Foreign, red seal, dry	"	.06@.06¼
Green seal, dry	"	.06¼@.09½
POTASH—		
Caustic, ordinary	"	.04½@.04⅞
Elect. (90%)	"	.06¼
POTASSIUM—		
Bicarbonate cryst	"	.08¼
Powdered or gran	"	.14
Bichromate, Am	"	.08½@.08¼
Scotch	"	.08½@.09
Bromide	"	@.30
Carbonate (80@85%)	"	.03½@.04⅝
Chlorate, powdered	"	.06¾@.07¼
Crystals	"	.06¼@.07
Chromate	"	.35
Cyanide (98@99%)	"	.19½@.20
Kainit	lg. ton	9.30
Manure salt, 20%	100 lbs.	.66
D'le Manure Salt, 48@53%	"	1.12
Muriate, 80@85%	"	1.83
95%	"	1.86
Permanganate	lb.	.09½@.09⅝
Prussiate, yellow	"	.14½@.14¾
Red	"	.36 @.36¾
Sulphate, 90%	100 lbs.	2.11
95%	"	2.14
Sylvanit	unit	.41
QUARTZ—(See Silica.)		
SALT—N. Y. com. fine	280 lbs.	bbl..72@1.18
N. Y. agricultural	sh. ton	4.40
SALTPETER—Crude	100 lbs.	3.40@3.50
Refined	"	4.00@4 50
SILICA—		
Ground quartz, ord'ry	sh. ton	9.00@10.00
Best	"	12.00@13.00
Lump quartz	"	2.50@4.00
Glass sand	"	2.75
SILVER—Chloride	oz.	.65
Nitrate Crystals	"	.37½
Oxide	"	.85@1.10
SODIUM—		
Bicarb., ord., bulk f.o.b. wk's	100 lbs.	1.30
Extra domes., f. o. b. works	"	3.50
Bichromate	lb.	.06¼
Carbonated ash, high test, in bags, f.o.b. works	100 lbs.	.72½@.80
Foreign, f.o.b. N. Y.	"	.90@.92½
Caustic, 70@76%, f. o. b. works	"	1.75@1.90
Foreign, f.o.b N. Y.	"	1.90@1.95
Chlorate, com'l	"	.06¾@.07
Hyposulphite, Am	"	1.60@1.65
German	"	1.70@1.90
Nitrate, spot and nearby	"	2.15@2.20
Shipments	"	2.05@2.10
Peroxide	lb.	.45
Phosphate	"	.02½@.02¾
Prussiate	"	.10½
Sal soda, f.o.b. works	100 lbs.	.60
Foreign, f.o.b. N. Y.	"	.67½
Silicate, concentrated	lb.	.06
Com'l	"	.01
Sulphate, com'l	100 lbs.	.83¾
Sulphide, crystals, bbl.	lb.	.01¾
Sulphite crystals	"	.02¾
SULPHUR—Roll	100 lbs.	1.85
Flour	"	1.90
Flowers, sublimed	"	2.20
TALC—N. C., 1st grade	sh. ton	20.00
N. Y., Fibrous, best	"	10.28
French, best	100 lbs.	2.00
Italian, best	"	2.25
TAR—Regular	bbl.	2.70
Oil, bbl	"	4.00
TIN—Crystals, bbl	lb.	.21¾
Oxide	"	.35
URANIUM—Oxide	"	2.25@3.00
ZINC—Metallic, ch. pure	"	.07@.09⅝
Carbonate, ppt	"	.09
Chloride solution, com'l	"	.09¼
Chloride granular	"	.15
Dust	"	.04¾@.04⅞
Sulphate	"	.02¾@.02⅝

THE RARE EARTHS.

BORON—Nitrate	lb.	$1.50
CALCIUM—Tungstate (Scheelite)	"	.60
CERIUM—Nitrate	"	10.00
DIDYMIUM—Nitrate	"	35.00
ERBIUM—Nitrate	"	40.00
GLUCINUM—Nitrate	"	20.00
LANTHANUM—Nitrate	"	30.00
LITHIUM—Carbonate	"	1.35
LITHIUM—Nitrate	oz.	.60
STRONTIUM—Nitrate	lb.	.07⅞@.08¼
THORIUM—Nitrate 49@50%.	"	4.50
URANIUM—Nitrate	oz.	.25
ZIRCONIUM—Nitrate	lb.	8.00

NOTE.—These quotations are for wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. Readers of the ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.